TANKS & TERMINALS
A SUPPLEMENT TO HYDROCARBON ENGINEERING

Rohan Awasthi, Emerson, USA, explores how cloud-hosted software-as-a-service platforms are reshaping terminal operations, by streamlining order management, generating more accurate and improved invoicing, automating reporting, and enhancing cybersecurity.



FROM DOCK TO CLOUD

Today's terminal operators are facing a more complex set of operational challenges than ever before. An expanding global marketplace has dramatically increased competition, so companies must not only be more efficient and effective in their operations, but also more flexible if they intend to maintain their market advantage. Basic optimisation is no longer enough as teams must find ways to drive increased operational excellence from end to end across their facilities.

Meeting these challenges is further complicated by new factors. Many, if not most, of today's expert personnel are nearing retirement, and newer recruits – if they can be found – have been trained in an era of digitalisation. The best new personnel are expecting powerful software tools to help them make better decisions and improve their performance. Providing those tools is key to attracting and retaining the best talent.

Added to those challenges is a wide array of new cyber threats that bring extra risk to terminal operation. Just as companies are increasing their software footprint, they must also worry that bad actors are looking for vulnerabilities in their systems. Terminal operators must be ready not only to defend their systems, but also to comply with increasing regulations to ensure cybersecure operation.

To meet these challenges, forward-thinking companies are turning to increased digitalisation within a zero-trust cybersecurity framework. Modern software unlocks new operational capabilities to close knowledge gaps, capture competitive advantage, and drive increased profitability, all within a secure operation. Selecting the right software requires a solution that meets the needs of today's terminal operations with technologies that will remain evergreen and easy to maintain across the lifecycle (Figure 1).

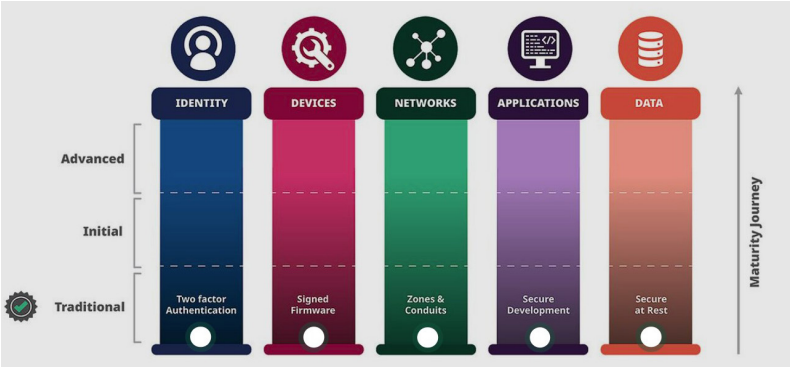


Figure 1. Emerson's Zero Trust Maturity Model is a five-pillar roadmap spanning from traditional security to resilient, optimised architectures through continuous access validation.

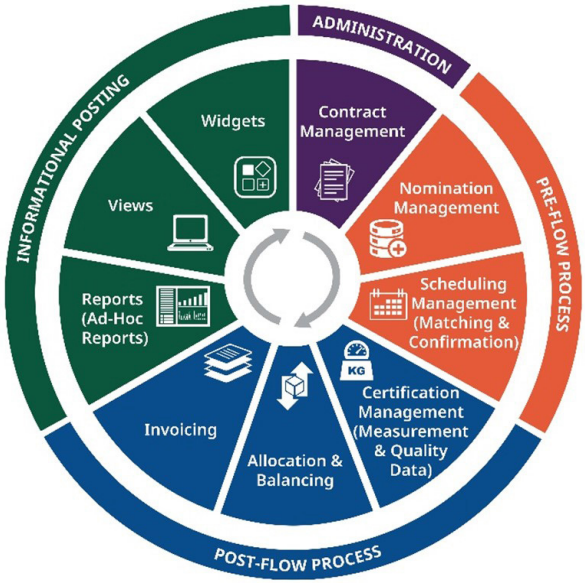


Figure 2. Enterprise order-to-cash software allows terminals to efficiently manage the entire lifecycle of product storage and transportation.

Streamlining workflows to improve overall performance

Running a terminal effectively means managing many complex elements. For example, teams must manage customer tank inventory efficiently and accurately, and this requires traceability and accountability across the entire facility at all times. The site must also carefully track tank heating, cleaning, and mixing activities, as well as generate real-time and month-end charges, sending clear and correct invoices directly to enterprise resource planning software. Terminals also need tools to help create a comprehensive and reliable paper trail for audits, and to identify and minimise demurrage events to reduce costs.

Additionally, teams must find ways to improve collaboration between customers and the terminal's operations staff. Often that requires a centralised repository of information, along with automation of key competencies, such as customs and excise reporting.

Once the facility has its customer and product management activities locked down, operators need to find ways to continually increase productivity. Accomplishing that goal requires increased visibility into operations, as well as finding ways to maximise uptime and asset utilisation across the facility.

Meeting all these goals is challenging because each process requires significant collaboration, which is further complicated by any manual steps. That manual activity leads to delayed response times, lack of visibility and traceability across the facility, and human error. Ultimately, those challenges decrease revenue, delay turnaround times, and can even lead to financial penalties.

Comprehensive order-to-cash software can help teams navigate these challenges. Order-to-cash software connects commercial and administrative systems with field devices and operations systems in a single cohesive digital solution. Armed with integrated software, terminal operators can provide better order and contract management, planning and scheduling, measurement and ticketing, inventory management billing and invoicing, and compliance and reporting (Figure 2).

For example, when a truck or vessel arrives at the terminal and loads into a tank, order-to-cash software provides automated workflows from the terminal kiosk to weigh bridge data management, to radar gauging in the tanks, and more. This integration among all terminal activities makes it far easier to gather all the data points needed for fast, successful execution of orders. Plus, the terminal develops a favourable reputation with customers, many with the ability to select their terminal of choice.

Unlock long-term value with cloud capability

Many companies have leveraged automation software for years, to help drive operational excellence across their terminals. However, as experienced personnel begin to retire, these companies are also discovering that supporting the IT infrastructure necessary to run their software has become a new challenge. Operational technology (OT) personnel are already busy managing terminal operations, so they rarely have the extra time to manage servers, cybersecurity, and software to ensure solutions remain secure, effective, and evergreen. Moreover, even if a terminal has IT staff – which many do not – IT personnel often have difficulty understanding the unique needs of an OT environment, making it challenging to maintain infrastructure across the lifecycle of a software solution.

As a result, many terminals are pivoting to cloud solutions for their automation software. Modern Software-as-a-Service (SaaS) hosted in the cloud helps OT teams move away from managing infrastructure and applications, allowing them to focus on what they do best: operating the terminal.

Case study

One chemicals terminal operator recently moved from locally hosted software to a cloud SaaS solution. Since the

organisation originally built this facility, the team has had to perform software upgrades multiple times, every three or four years. Though upgrading the software required downtime and significant investment in new hardware, the company knew that it was worth ensuring that it always had the newest features, security patches, and hotfixes – along with performance and usability improvements.

When the terminal moved to a cloud SaaS solution, it eliminated the need to allocate personnel to manage its software. Instead, the software was continually updated by the automation supplier, ensuring that it was always the newest version offering the best security and features. In addition, the operations team also gained increased remote capabilities. When the team hosted its own software, connecting remotely required a complex network configuration allowing virtual private network access from specific computers. Today, authorised team members can access the software from anywhere in the world quickly and intuitively via a secure cloud interface (Figure 3).

The terminal also gained improved reliability. Because the software is hosted in the cloud, redundancy is built in. Availability of the software is improved, and database backups happen automatically every five minutes, so OT personnel no longer need to worry about data loss in the case of a failover.

The software is also far easier to scale. When the need for computational power increases, such as when the terminal is running reports, the software's capacity scales up accordingly. The team sees continuous performance no matter how the system is being used. As the company acquires additional sites, it can expand its existing system to cover those facilities more easily.

An AI/ML future without rip and replace

One of the key benefits of using automation software to support terminal operations is the massive catalogue of operational data that sites can collect. That data gives insight into what is working and what is not, and it can help teams unlock operational efficiencies to dramatically increase performance and competitive advantage. As artificial intelligence (AI) and machine learning (ML) tools rapidly emerge into the marketplace, terminal operators are looking for ways to take advantage of their capabilities without having to tear out their existing investments and start from scratch.

For one terminal operator, a critical challenge was knowing when each of its regular customers' ships would arrive and how long they would stay in the berth. The company had 10 years of historical data recording when each ship arrived and the duration it stayed. It wanted to use that data with ML tools to better anticipate when ships would arrive, then assign berths based on the most efficient utilisation.

Implementing an ML tool locally would have required powerful hardware to manage the workloads, and that power would have been more than the company needed after the analysis was complete. Instead, the terminal opted to move to a cloud-hosted SaaS solution for order-to-cash, with a built-in module to support ML via a large language model.

Using the model and the scalable compute power provided by the cloud, the team developed a schedule to better predict the arrival of ships and use their projections to improve their operational readiness. Simultaneously, they gained all the additional advantages of cloud-hosted software, further improving performance (Figure 4).

Long gone are the days when terminals could assume they would not be targets for cyberattacks. Security by obscurity is a relic of the past, so today's operators must always assume they will be targeted. Meeting that challenge means staying up-to-date with software to ensure it is continually updated with the latest security patches and features.

In most cases, organisations want to stay on top of security for software because it protects investments and reputation. However, more and more countries are imposing strict regulations, with the recent Cyber Resiliency Act in Europe being the latest example. Secure systems are becoming not just a benefit, but a requirement.

Managing cybersecurity on-site is challenging. Cybersecurity technology is not 'set-and-forget'. Teams



Figure 3. The intuitive dashboard in Emerson's order-to-cash software improves visibility to order status, inventory volume, and charges by shipper.

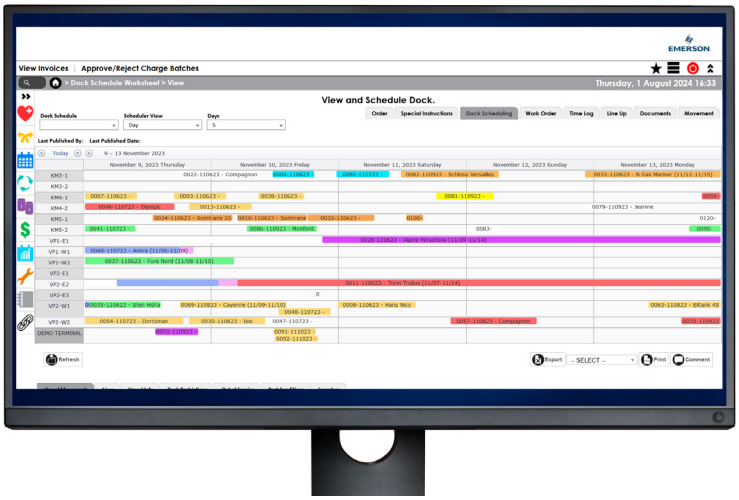


Figure 4. Emerson's O2CManager Software allows operators to view and share daily dock schedules with all necessary parties.

must continually stay on top of emerging threats to ensure their systems and networks are prepared to weather potential attacks. Doing so requires a great deal of time and knowledge.

Modern cloud SaaS solutions help teams improve their cybersecurity posture without having to maintain the infrastructure themselves. Expert automation suppliers host their software in cloud environments and leverage the best modern cybersecurity tools available. Even more importantly, those cybersecurity tools evolve alongside the cyber threats, updating to meet a new threat landscape without disrupting operations or taking personnel away from higher-value tasks.

As threats and regulations continue to increase, so will the amount of effort necessary to protect and comply. One of the most effective ways to navigate this challenge is with cloud technologies that are secure-by-design.

A seamless ecosystem

Not every software application a terminal needs to use will or should operate in the cloud. This means that teams will still need to manage local applications alongside their cloud solutions and must do so without creating new data siloes. To meet this challenge, automation solution providers have been developing next-generation tools around an enterprise operations platform. These tools are built on a data fabric that connects all of an organisation's assets, from the intelligent field through the industrial edge, and into the cloud.

As teams evaluate new cloud technologies to digitalise terminal operations, engineering with an enterprise operations platform in mind can help build a foundation for more efficient operation as new technologies emerge. Standardising on software that is integrated by design eliminates the need for complex, custom engineering that creates data siloes and impedes innovation and progress. Leveraging the data fabric designed into an enterprise operations platform helps teams ensure that all their data, regardless of its source, can be standardised – with context – and made securely available anywhere across the enterprise for consumption by applications and authorised personnel.

A competitive edge

As terminal operations teams navigate a new environment of fewer people, and a greater need for optimisation and operational excellence, cloud software – intentionally designed as part of an enterprise operations platform – will help maintain the value of automation investments across the lifecycle.

Cloud-based SaaS tools, such as order-to-cash software, will stay evergreen and continually available, even as its features, AI and ML capabilities, and security footprint increase. Even more importantly, teams will be empowered to reduce their focus on maintaining IT infrastructure and instead invest their expertise and energy into improving operations to stay competitive, no matter what challenges lie ahead. T&T