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NORTH AMERICA

14-15 NOVEMBER 2023 | VIRGINIA, NORFOLK, USA

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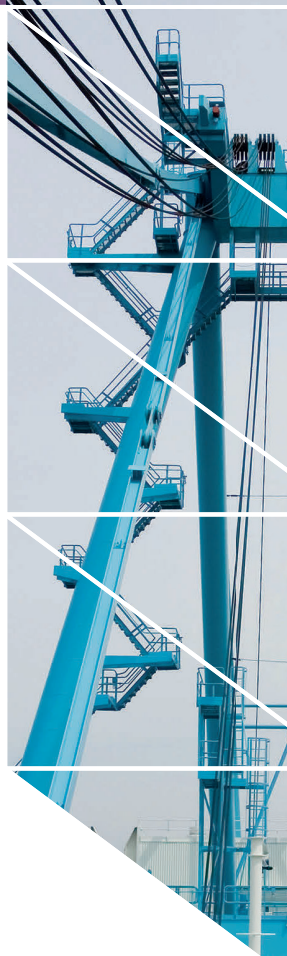
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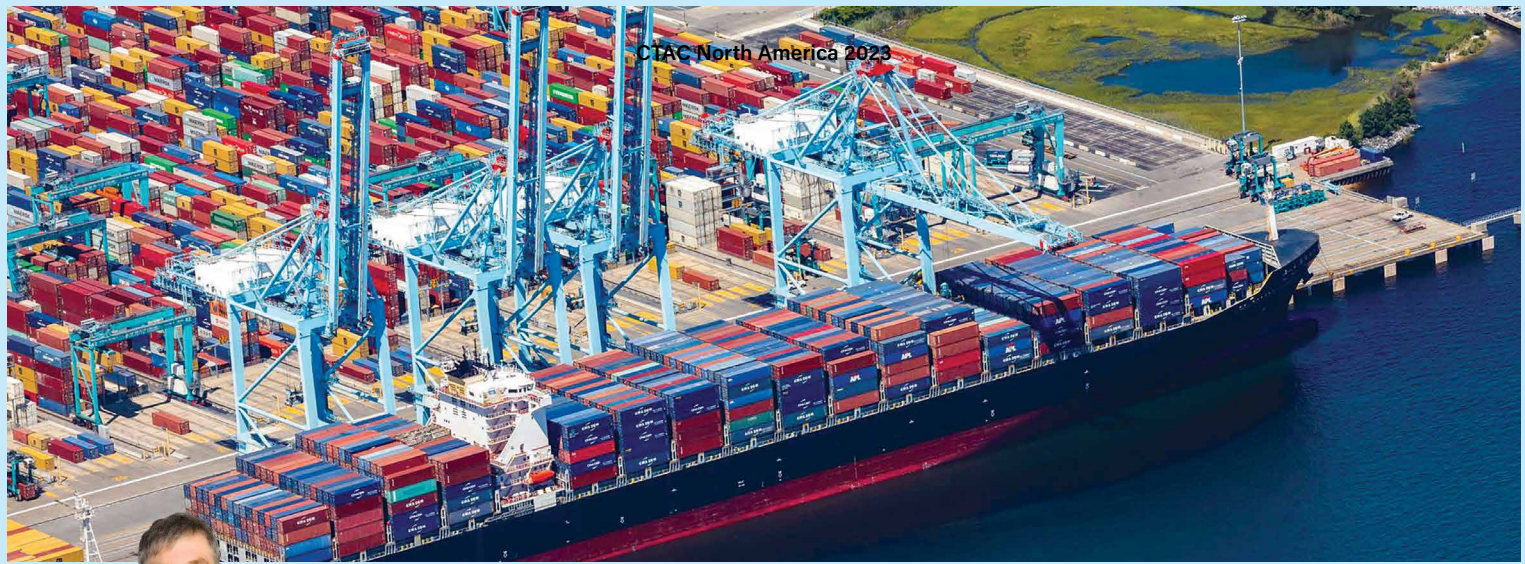
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Rich Ceci, Senior Vice President Technology and Projects, Virginia International Terminals

A SPECIAL WELCOME FROM OUR HOST PARTNER: THE PORT OF VIRGINIA

When Port Technology International (PTI) asked me to write a welcome for the event I was honored. PTI's Container Terminal Automation Conference (CTAC) has become a well-established forum for collaboration and information sharing in the container terminal industry. I have attended upwards of five over the years and usually have been a presenter on a topic of interest. The attendees are always very engaged and collegial when it comes to both questions and answers.

Almost a year ago, PTI indicated an interest in creating its first of these events outside of Europe and asked if we would be willing to host it here in Norfolk, Virginia. I was enthusiastic from the start and thankfully our management also thought it was a great idea.

We here at The Port of Virginia have been focused on this since 2007 when the first semi-automated terminal in the Western Hemisphere came on line in Portsmouth. At the time it was the culmination of a vision that was shared at the highest levels of the Maersk organization. That was evident when the 90-plus-year-old Maersk Mckinney Moller – son of the founder of Maersk would pay frequent visits to tour a very rugged construction site. He was both engaged and excited by the

project. His grandson was part of the implementation team.

The terminal was built on time and on budget and fulfilled all the promises about safety and productivity. After terminal operations transferred to The Port of Virginia in 2010, the vision expanded to one that would ultimately encompass the entire port.

During the past seven years, we have completed \$1 billion of projects that have doubled the capacity of the port. At present, we have another \$1.4 billion in progress due to be completed in stages between now and 2027. We take progress seriously here and are proud to have established the nation's most modern maritime global gateway.

In 2004, when we started building the Virginia International Gateway terminal, there were no case studies available that matched our plans. Though there were two operating automated terminals in Europe – one in Rotterdam and one in Hamburg – they were somewhat different than our scenario. Those projects had a large staff of technologists and required more than 10 years of development. Everything was custom and built with exacting precision. The solutions were subsequently refined by years of operational diligence.

We were somewhat brash. We had a team of eight people, a limited budget, and a desire to create a solution by bolting together best-of-breed technologies in just three short years. To accomplish this we took many trips to see several technology components working in various terminals all over the world.

As we traveled we met a lot of great people and they all had one thing in common: a willingness to share their experiences. This impressed us greatly and was a major contributor to our success. We vowed that once we finished we would return the favor and be open about what we have learned and our experiences – good and bad. Thankfully due to a lot of hard work, there have not been many bad experiences!

Since we opened we have typically hosted 2,000-plus visitors per year – many with aspirations of building a high-technology terminal – to ask questions. This operating approach is not an experiment and we are anxious to share our thoughts and learn about your plans. We learn new things all the time and hope that the next few days will be rewarding and worthwhile for all the participants.

Welcome to the event and we sincerely hope you will have all your questions answered.



FOREWORD

Margherita Bruno,
Editor



Welcome to this month's special edition of PTI's journal where we will embark on a journey through the ever-evolving realm of container terminal automation. We are honored to present this issue to mark the celebration of our Container Terminal Automation Conference (CTAC), coming for the first time to North America after a successful seven-year run in Europe!

The maritime industry has experienced a seismic transformation, and we are on the brink of a new era driven by technological innovation. Terminal automation enhances efficiency, cuts costs, and benefits both port operators and global trade networks. It also contributes to environmental relief by reducing congestion, emissions, and pollution at ports, promoting sustainability. However, achieving full automation presents challenges such as safety concerns and high initial costs. Embracing automation should be a carefully considered decision based on the specific needs and conditions of each port.

We hope this collection serves as a useful guide for all stakeholders in the ports and terminals industry, offering inspiration through remarkable advancements and insightful perspectives that define container terminal automation. We want to extend our heartfelt gratitude to the dedicated contributors who have turned this special edition into a reality. Special thanks are due to our partner host, The Port of Virginia.

Our contributors will span the entire spectrum of topics, including Artificial Intelligence (AI), data projects, startup partnerships, and cybersecurity certification.

Our Headline Sponsor and Digitalization Partner, Nokia, kickstarts this edition by highlighting the imperative need for closer alignment between IT and OT investments. This is crucial to meet the demands of the digital age and promote digitalization, particularly in the context of private wireless connectivity. Nokia's paper serves as reminder that technological advancements are instrumental in enhancing efficiency, safety, and sustainability in port operations.

Next, CTAC's Official AI Sponsor, INFORM, delves into the state of the global supply chain industry, reflecting on the profound impact of COVID-19 and emerging trends. The pandemic underscored the supply chain's pivotal role in the global economy and ignited a renewed focus on automation. In an unpredictable world, marked by disruptions such as trade wars, climate change, and geopolitical shifts, resilience is paramount. INFORM's AI and algorithm-based decision support software plays indeed a pivotal role in fortifying terminal operations, enabling operators to navigate disruptions more efficiently.

Taking center stage, DMSLOG.AI advocates for collaboration between

startups and established IT partners to drive data projects in terminal operations.

Such partnerships are crucial in fostering innovation within the industry, emphasizing the critical role of cooperative efforts in enhancing existing IT environments.

Finally, Portchain addresses a significant dilemma within the contemporary supply chain. The issue at hand is not the scarcity of data, but rather the inundation of unstructured data from diverse origins. To attain operational efficiency, the imperatives are transparency and collaboration. Stakeholders must be prepared to exchange data and harmonize efforts to establish a dependable "single source of truth".

The maritime industry is not just adapting to change; it is driving change. Through these articles, we aim to empower everyone to grasp, embrace, and leverage the opportunities that automation and digitalization bring to the dynamic and complex world of ports and terminals.

On behalf of our team at PTI, we kindly invite you to explore these articles with an open mind and a spirit of adventure, and hope that your time at CTAC will be productive and inspire you with fresh perspectives and ideas for the future.

Enjoy your reading, and we look forward to welcoming you in Virginia!



CONTENTS

5.

CTAC NORTH AMERICA 2023 SPEAKERS

12.

CTAC NORTH AMERICA 2023 SPONSORS

19.

BUILDING A DIGITALIZATION FOUNDATION FOR PORT 4.0

Todd Nate, Head of Private Wireless Sales, North America, Nokia

25.

THE 'A-WORD'. AND OTHER TRENDS SHAPING MARITIME

Dr. Eva Savelsberg, Senior Vice President, INFORM, and
Matthew Wittemeier, Director of Marketing and Sales, INFORM

30.

AI AND DATA PROJECTS IMPLEMENTATION ON TERMINAL. HOW TO SUCCESSFULLY WORK WITH STARTUPS

Xavier des Minières, CEO, DMSLOG.AI

35.

KALMAR LEADS THE WAY IN CYBERSECURITY CERTIFICATION FOR THE TERMINAL INDUSTRY

Timo Alho, Director, Product Management Automation, Kalmar

39.

A PRIVATE CELLULAR BUYERS' GUIDE: THE ESSENTIALS OF BUILDING A PRIVATE 5G OR LTE NETWORK

Ericsson

46.

NAVIGATING SEAS OF DATA

Dr. Jasper Boessenkool, Senior Director Sales, Portchain

50.

MINIMISED AGV APRON. A SUSTAINABLE APPROACH TO WATERSIDE OPERATIONS

Jeroen Kats, Project Director, Portwise

55.

SPEEDING UP THE SUPPLY CHAIN: A GUIDE FOR REAL-TIME TRUCK DATA COLLECTION AND SHARING

Lucy Lai, Director of Product Marketing, SMATS Traffic Solutions

60.

A DIGITALIZATION JOURNEY FOR COMPLEX PROBLEM SOLVING IN DYNAMIC ENVIRONMENTS TO ACHIEVE ILL-DEFINED GOALS

Ángel Martínez, Head of Products Terminal Solutions, Prodevelop,
Francisco Blanquer, R&D Senior Manager, CMA CGM and Chair
Operations Council, Terminal Industry Committee 4.0, **Ben Othman**
Nasser, R&D Digitalization for Terminals, CMA CGM

65.

AI REVOLUTION IN SUPPLY CHAIN OPERATIONS

Sawyer Smith, Product Manager, FourKites

68.

REAL-TIME DATA SHARING IN SUPPLY CHAINS: OPPORTUNITIES AND CHALLENGES

Wolfgang Lehmacher, Supply Chain and Technology Strategist,
with **Mikael Lind**, Senior Strategic Research Advisor, RISE, and
(Adjunct) Professor in Maritime Informatics, Chalmers

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SPEAKERS



Adam Schipper, Director Business Development-Transportation & Logistics, ERICSSON

Adam has over 25 years working in the transportation industry and with a proven passion for the industry, he received his Certified Transportation Professional designation from the National Private Truck Council. Adam focuses on the adoption and acceleration of digital transformation in the transportation arena. In addition, he is responsible for advocating and helping the ports, aviation, rail and the connected car industry.



Alan Peterson, Consultant, Automation, MARINE CONTAINER TERMINALS

Alan was involved in technical sales from 1978 joining first Westinghouse and then GE in 1989, initially responsible for supporting heavy industry, container ports and shipbuilding in Virginia, USA. Alan transitioned to TMEIC in 2006 finishing his last 16 years in the marine terminal marketplace before retiring as Business Segment Leader/ Crane Systems in 2022. Container terminal automation and advanced lifting equipment technologies are his specialty. Since retiring, Alan has enjoyed life at his own pace doing many things, but has kept a hand in the working world consulting on Marine Container Terminal Automation and Efficiency.



Anton Bernaerd, Business Development Director, CAMCO TECHNOLOGIES

Anton Bernaerd is Head of Sales and has spent almost 20 years as part of the Camco Technologies team. Anton has been sharing insights on process optimization and terminal automation in more than 250 terminals across the globe. His unique expertise in gate and crane automation makes him an authority speaker in industry events.



Ashebir Jacob, Vice President, MOFFAT & NICHOL

Ashebir Jacob has successfully led multidisciplinary design teams to deliver planning, design, and construction of green and brown field projects of different sizes and complexities. With more than 30 years of professional experience, Ashebir's planning work has included the preparation of feasibility studies, operational analysis, and the development of general cargo terminals, conventional and automated container terminals, and rail intermodal facilities.



Brad Calhoun, APMT Global Product Manager for Gate, Rail and Reefer Automation, APM TERMINALS

As the APMT Global Product Manager for Gate, Rail and Reefer Automation, Brad is responsible for evaluating terminal operations and identifying the best use of automation to improve safety, reduce operating costs, increasing throughput, and reducing carbon emissions. Over the last 20 years in the container terminal space, he has led teams in both IT and operations designing and developing solutions to optimize the flow of containers through a terminal with a focus on improving the customers' experience.



Brett Leatherman, Section Chief, FEDERAL BUREAU OF INVESTIGATION - CYBER DIVISION

Brett is Section Chief of cyber national security work for the FBI. Under Presidential Policy Directive 41, the FBI is the lead cyber threat response agency for the United States Government, and in this role, Mr. Leatherman serves as a Senior Executive managing the FBI's strategy to impose risk and consequence on some of the most sophisticated state sponsored cyber adversaries targeting U.S. interests.



Cathie Vick, Chief Public Affairs Officer, PORT OF VIRGINIA

Cathie J. Vick is the Chief Development and Public Affairs Officer (CDPAO) for the Virginia Port Authority (VPA) where she oversees The Port of Virginia's government relations, community outreach, development and transportation policy, sustainability, and maritime incident response.

SPEAKERS Continued



Christian Blauert, Global Director Port and Terminal Development, MOFFAT & NICHOL

Christian has over 25 years of experience within the maritime industry with a strong focus on container terminal developments, terminal management, automation projects and management-strategy as well as business development. During his time working for terminal operators, Christian led the businesses through significant organic and inorganic growth including the addition of several new container and multi-cargo concessions and capital works developments; both brown and greenfield.



Darren Honaker, Industrial Systems Commercial Director, TMEIC

Darren's career began with field, control and application engineering assignments working closely with clients to solve problems and improve systems in a variety of industry segments including container ports, mining, metals, pulp & paper and water & wastewater. He holds an MS in Systems Engineering from Virginia Tech, and a BS in Electrical Engineering from Virginia Tech. Darren resides in the Alleghany Mountains of Virginia and is active in his community.



David Dierker, Senior Expert, MCKINSEY & COMPANY

David has over a decade of experience in port planning and marine engineering for a global infrastructure advisor and as a working team member for the world association for waterborne transport infrastructure. He has advised port and shipping clients on over 80 unique projects spanning over 35 countries in services including acquisition due diligence, market entry, throughput growth, project management, strategic master planning, and infrastructure development.



David Shore, Head of Engineering, PORTS AMERICA

David oversees Ports America crane and equipment engineering strategy, asset management approach and equipment standards across all operations. David has 30 years of success in crane and power equipment engineering. Prior to Ports America, David most recently served as the Head of Port Services, Americas for ABB and prior to that, Head of Global Engineering, Technical Support and Execution for APM Terminals. David is a noted advocate for safety and standardization to ensure optimized business operations and maintenance.



Eduardo Giancristofaro, Channel Development Director - OT, SSH COMMUNICATIONS

Eduardo has been involved in the Industrial Automation arena since 1994, when he started his career as a PLCScada programmer at different systems integration companies. Later, he made a career shift onto industrial communication network sales, becoming specialized on industrial network integration solutions and wireless networks. In 2017, Eduardo moved his attention to Industry 4.0 by helping machine builders to innovate their product portfolio through the offering of digital services, transforming mere equipment into higher value-added assets to the end user.



Erik Ward, CIO, GLOBAL CONTAINER TERMINALS

Erik's role is to lead the IT strategic vision, day-to-day operations and projects for Technology & Systems at GCT terminals worldwide. Notable systems projects include the Deltaport Rail Expansion Project in British Columbia, which brought multiple technologies together to surpass safety, production, and capacity targets. Prior to joining GCT, Erik was a senior leader at Navis LLC, where he was RVP of Customer Operations and responsible for customer care and support for over 100 terminals. He has also held leadership roles for SSA Marine and Tideworks Technology in Seattle and Panama City, Panama.



Gerry Bisaillon, Senior Vice President, RPX OPTIMIZATION

Gerry provides expert consulting services on terminal planning, engineering design and process optimization using his over 25 years of experience in terminal operations, transportation and logistics. Gerry is an active member of the Intermodal Committee of the Association of American Railroads, as well as on numerous committees for IANA including the Safety, Maintenance, and Operations committees. He is currently serving as Chair of the Operations committee.


Jean-Philippe Joassin, Director of Process Automation, KALMAR

Jean-Philippe is the Director of Process Automation at Kalmar, where he has passionately contributed to technological advancements for over a decade. With a background in automation and RFID, he leads a dedicated team in optimizing automation processes. Prior to Kalmar, Jean-Philippe worked for Zebra Technologies mostly in Automotive manufacturing RFID solutions. Jean-Philippe holds a Bachelors of Science in computer Science from Lawrence Tech University.


John Lund, Sales & Marketing Director, VISY-OY

John has more than 18 years of experience helping marine and intermodal terminals achieve their operational objectives with digitalization strategies. Having worked on scores of complex process-automation projects, John supports operators in defining, designing, developing, and deploying systems that improve safety, efficiency, and profitability. His career motivation is grounded in the understanding that the solutions he provides are instrumental in guiding the supply chain toward being an ever more dependable and resilient network.


Jost Daemmgen, Industry Segment Leader - Port Solutions, TMEIC

Jost Daemmgen has worked in the container handling equipment industry since 2005. Prior to leading the global TMEIC Port Solutions Sales Team he held various positions in Crane Service, Site Management, Project Management, and Sales with Konecranes, Kalmar and TMEIC. His mission: creating optimum control and automation system solutions for our container port and terminal clients. Jost holds a Dipl.-Ing. Mechanical Engineering degree with focus on automation technology from the University of Applied Science Ostfalia, Wolfenbuettel, Germany.


Julian Galvis, VP Sales & Regional Manager, IDENTEC SOLUTIONS

Julian has been at Identec Solutions since 2018 and has a strong operations background, covering a broad range of experience including Terminal Operations, public sector consulting and software project execution. Throughout his career, which spans more than 23 years in the maritime sector, Julian has personally visited over 160 marine terminals in over 52 countries in order to gain a better understanding of the challenges and discuss how technological solutions could solve them.


Dr. Lov Kher, Managing Principal & Technology Fellow, 5G Acceleration, VERIZON BUSINESS GROUP

Dr. Lov Kher is Managing Principal & Technology Fellow, 5G Acceleration for Verizon Business Group. He is leading a team of distinguished architects and thought leaders working to accelerate the adoption of emerging product/solutions categories such as private 4G/5G networks, mobile edge computing and managed solutions. Lov's focus is on the development of innovative solutions with emerging platforms leveraging a portfolio of network services, and support customers in their transformative journey, help drive business outcomes and solutions design leveraging our broad portfolio of capabilities.


Maggie Hartless, Sales Application Engineering Manager, TMEIC

Maggie leads a team of engineers responsible for preparing technical and commercial specifications for drive and automation systems in the container crane and metals industries. She originally joined TMEIC in 2015 as a Sales Application Engineer prior to her promotion in 2020. Before joining TMEIC, Ms. Hartless served as an officer in the United States Navy. While on active duty, she served as an instructor at the Navy's Nuclear Power School in Charleston, SC earning a Master Training Specialist designation.

SPEAKERS Continued



Marc-Andre D'Amico, Project Manager IT - Automation, TERMONT

Marc-Andre D'Amico is the Automation Project Manager at Termont, Port of Montreal. With a strong operations management background, Marc-Andre currently leads automation projects, primarily focused on elevating operations to new heights through the strategic implementation of technology. Marc-Andre holds a Bachelor of Business Administration at University of Montreal.



Marco Fehmer, Chief Executive Officer, DSP DATA & PLANNING

Marco is Civil Chartered Engineer with a specialization in transportation and logistics. He joined DSP Data and System Planning SA in 2007 and since 2017 has been appointed as Chief Executive Officer. DSP is one of the most worldwide recognized and valuable Terminal Operations Systems (TOS) implementation and process optimization consulting partner. In 2020 Marco has been appointed as President of the Board of DSP LAB Pvt, Chennai India and in 2021 Member of the Board of Directors of DSP TALUMIS BV and since 2022 is CEO of DSP AMERICA Inc.



Mark Higgins, Director of Motor Carrier Experience, PORT OF VIRGINIA

Mark began his career in The Port of Virginia as an Assistant Operations Manager for APM Terminals in 2005. Mark joined the APM Terminals Virginia Project team in 2006 where he developed the Semi-Autonomous Remote Operator Program which transitioned conventional Rubber Tire Gantry (RTG) crane operators into a semi-automated operating environment. Mark was a key contributor to the original VIG project where he held numerous roles related to automation and the implementation of high technology into terminal gate operations.



Mark Mendes, Vice President Information Technology, TRAPAC

Marc provides leadership that focuses on the technological requirements, opportunities, and challenges within TraPac. His primary goal is to steer the organization toward greater efficiencies and better performance through innovative technology products, services, and environmental social governance.



Martin Aufschläger, Member of the Board of Directors, BOXBAY

Martin has more than 15 years of experience in the Industrial Goods & Services sector. Martin started his career with the leading international strategy consulting firm Bain & Company before joining SMS group in 2012 where he has held different management positions. Within SMS group Martin is responsible for the port logistics business. This also includes the roles of Member of the Board of Directors of BOXBAY and Member of the Managing Board of AMOVA, the logistics specialist within SMS group.



Dr. -Ing. Mathias Dobner, CEO & Chairman, BOXBAY

Clear goal of all of Mathias' activities has always been to develop customer-orientated solutions by examining the possibility to transfer industrial technologies and trends to port technology applications. He has a deep understanding of the variety of interfaces, environmental influences and material flow requirements in container terminals and sees a holistic system solution approach as crucial for the development of successful, efficient and effective handling systems.



Matthew Wittemeier, Director Marketing and Sales, INFORM

Matthew is Director Marketing and Sales at INFORM's Terminal & Distribution Center Logistics Division where he's become a thought-provoking contributor to many industry publications and conferences. He's co-author of the multi-award winning 2038: A Smart Port Story – a novella about the future of technology and the social challenges it may bring. In addition, he is a member and judge at The Academy of Interactive and Visual Arts (AIVA), as well as having been the senior producer and host of the buzz!Talk podcast and served on the board of YoungShip Rotterdam.


Peter Miller, Technology Specialist Director, Private Wireless, NOKIA

Peter has been working in the networking industry for over 35 years, as both an RF Technician/ Engineer (US Army 33S) and Systems Engineer at sizeable global companies. Throughout his career he has been involved in networking technologies and products including high security wired and wireless networks, video surveillance cameras, autonomous hauling, PC networking technology, and Wi-Fi networking products. He submitted several patents which ultimately drove the requirements for Wi-Fi connectivity initiatives. Peter is experienced with commercial and federal marketplace, sales channels, and project management.


Rafael Velasquez, Director Optimization and Integration, INFORM

Rafael Velasquez is Director Optimization and Integration at INFORM's Terminal & Distribution Center Logistics Division. He has worked in optimization projects over the last 17 years within the Research and IT sector. He joined INFORM in 2008 with a focus on advancing optimization solutions in the container terminal industry in which time he has headed multiple notable international projects with customers such as GCT, DP World, and TraPac. He is a frequent specialist speaker at industrial and academic conferences where he promotes the real-world opportunities that Operations Research and AI open.


Ramana Jampala, President & CEO, AVLINO

Ramana is Co-founder and CEO of Avlino, bringing his unique vision on technology trends and market impact to the forefront of the company's strategy. He is an entrepreneur and versatile Technology Executive with 25 years of global experience in Investments, Business Strategy, Advisory Services, and Design Engineering. Ramana's career includes implementing digital initiatives of Fortune 500 companies and high technology start-ups. Interested in funding technology companies, as a General Partner of SAS Investors, Ramana led early-stage investments and served on the Board of Directors of several successful enterprises.


Rene Alvarenga, Sr. Director of Product Management, KALERIS

Leveraging his depth of expertise in cargo movements across various supply chain nodes, Rene leads the development of the Kaleris Execution & Visibility Platform, a first-of-its-kind solution that enhances connectivity between execution nodes in the supply chain, including ports and marine terminals, shipping lines, inland yards, and distribution centers. It empowers downstream shippers and cargo owners to optimize their operations by replacing data gaps with accurate cargo visibility insight and the ability to take action to achieve better outcomes.


Rich Ceci, Sr Vice President Technology and Projects, PORT OF VIRGINIA

Rich joined VIT in May 2016 as Senior Vice President of Technology and Projects. He is responsible for the major expansion projects in The Port of Virginia. Rich and his team have completed expansions to two of the port's largest terminals that have increased capacity by 40 per cent. These expansion projects include advanced technology focused on improving both safety and productivity in the port. Previously Rich was VP of Information Technology for GCT USA in Bayonne NJ where he managed the Global Expansion Project, winner of several industry awards.


Sean McCaskill, Shore Power Solutions Manager, Americas, IGUS

Sean McCaskill serves as the leader of the Shore Power Solutions business unit in the Americas. He brings his experience and knowledge of port equipment and terminal operations to the growing shore power market. He is one of the creators of both the igus Mobile Shore Power Outlet and igus e-chain Reel products which are successfully providing the operational flexibility that is needed to meet today's ambitious emissions reduction goals.

SPEAKERS Continued



Shannon N. Gilreath, Rear Admiral, US COAST GUARD

Rear Admiral Shannon N. Gilreath assumed the duties of Commander, Fifth Coast Guard District, in May 2022. RADM Gilreath serves as the operational commander of all U.S. Coast Guard missions from the North Carolina, South Carolina border to New Jersey, encompassing nearly 3,000 Coast Guard active duty, reserve, and civilian personnel. This area spans 1.4 million square miles of oceans, bays, and rivers, several mid-Atlantic ports, the largest U.S. Naval Base in the world, and our National Capitol Region.



Stephen Edwards, CEO and Executive Director, PORT OF VIRGINIA

Stephen is responsible for the broad programmatic areas of business and relationship development, infrastructure development, strategic marketing, economic development, finance, security and safety. He directs and manages the operations of Virginia's marine and inland terminal facilities through Virginia International Terminals, LLC, the port's private terminal operating company, including Virginia International Gateway, Newport News Marine Terminal, Norfolk International Terminals, Portsmouth Marine Terminal, Richmond Marine Terminal and the Virginia Inland Port.



Vincent Liegeois, Business Applications Manager, TERMONT

Vincent Liegeois began his career in the maritime industry as a planner (yard/vessel/rail). In 2018 he transitioned in the IT department as a business analyst before moving up to the position of Business Application Manager and leading the business system team. Over the years, he has acquired a large experience in supporting business system and leading technological projects such as billing process changes, ERP upgrades, EC Implementation, improvement of gate automation, reefer monitoring systems, and lately the implementation of the AI-powered VBS system by DMS.



Xavier Des Minieres, Co-founder, DMS LOGISTICS

Xavier's and his DMS co-founders' vision is to ease the pain of truckers at ports by improving terminal productivity and efficiency. The company's operational experience in various terminals around the world and its expertise in artificial intelligence, with regular significant research papers and awards, makes DMS a specialist in terminal gateway issues.



Yvo Saanen, Managing Director & Founder, PORTWISE

Yvo is in charge of all Portwise port & terminal related projects all over the world in their planning and optimization process of container terminals by means of simulation and emulation. In this role, he has participated in various projects, ranging from long term development, process improvement, terminal extensions and redesign of handling systems to design of greenfield terminals. Examples are the DP World's facility in Antwerp, and HPH's Euromax facility in Rotterdam, and OOCL's facility in Long Beach, but also recent automated terminals in Rotterdam by APMT and DP World.



Zack Thomas, Director of Operations Service Center, NORTH WEST SEAPORT ALLIANCE

Zack Thomas has over 30 years in the maritime industry. In the early 2000's he came ashore and began working for Marine Terminal Cop., a west coast Stevedore. Zack has held multiple positions within the industry, eventually ending up as the Terminal Manager for Peirce County Terminal in Tacoma. Most recently Zack has joined the NWSA as the Director of the Operations Service center. In this position he works with all the container facilities in Seattle and Tacoma on a host of issues centered around improving overall productivity and service levels.



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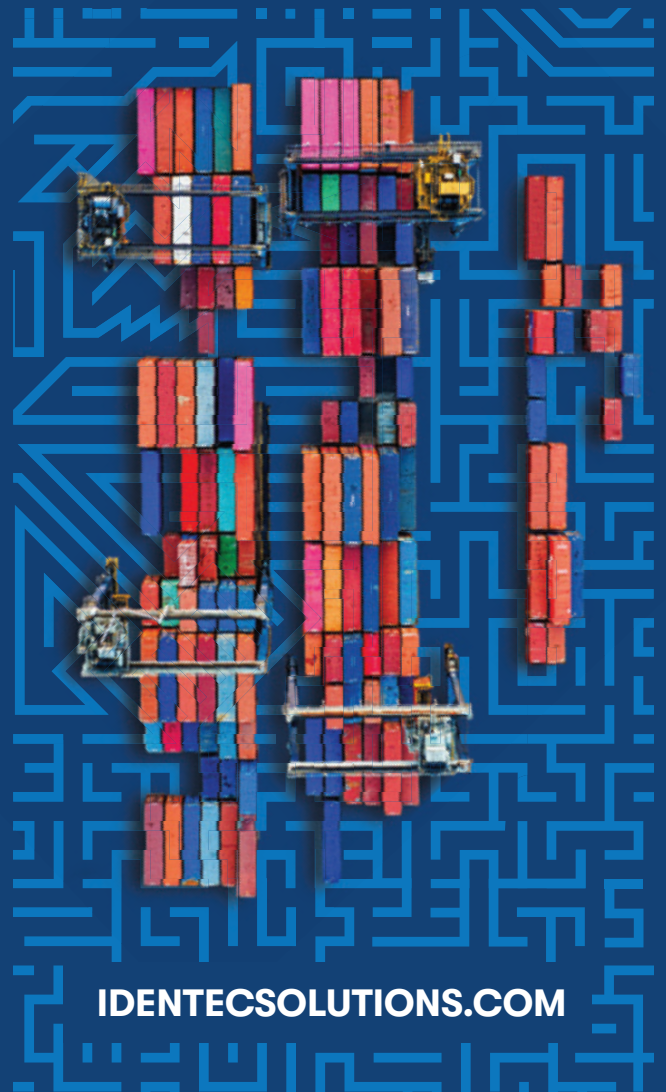


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Port of Virginia

The Port of Virginia is proudly recognized as CPPI's top-performing port and is located in Site Selection's 2022 Top State for Business Climate. The port exclusively owns and operates its terminals and the nation's leading chassis pool. At The Port of Virginia, customers and partners experience the efficiency and service excellence only offered through the most modern and technologically advanced container terminal operations on the coast. Currently underway, the port's \$1.4 billion Gateway Investment Program is building even greater port efficiency through additional semi-automation, expansion, and industry-leading sustainability commitments.

www.portofvirginia.com

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Nokia

At Nokia, we create technology that helps the world act together. As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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INFORM

INFORM specializes in AI and optimization software to improve operational decision making. Based in Aachen, Germany, the company has been in the optimization business for 50 years and serves a wide span of logistics industries including ports, maritime, and intermodal terminals. With a broad range of standalone and add-on software modules, INFORM's unique blend of algorithmic based software expertise, rich industry experience, and big world thinking delivers huge value for their customers.

www.inform-software.com/logistics/maritime-terminals

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TMEIC

TMEIC has a long, proud history in the crane industry, supplying equipment and systems throughout the world. Our control systems are designed to meet the most demanding applications and environmental conditions, including the latest in automation for both manned and unmanned operation to maximize crane productivity. At TMEIC, we drive industry.

www.tmeic.com

SILVER SPONSORS



Avlino

Avlino is a US-based Artificial Intelligence company specializing in delivering solutions to enhance the efficiency of Container Terminal Operations. The company aims to transform the supply chain by providing terminal operators with solutions to overcome common pain points and challenges that undercut their business objectives.

With this mission, the company developed AICON, a suite of solutions designed to dynamically solve the challenges of demand fluctuations. Combining AI/ML and Operations Research, AICON delivers actionable insights, real-time work instructions, and autonomous workflows in a cutting-edge approach that significantly reduces manual processes, increases throughput, optimizes resource allocation, and improves customer service.

www.avlino.com



DMS Logistics.Ai

DMSLOG.Ai uses terminal data to provide decision support and automation tools, and transform a port into a smart-port by tackling three main challenges: yard management, truckflow anticipation and resources optimization. DMSLOG.Ai main products are stacking strategy, resource planner and truck appointment system – all AI-based. They are for non automated and automated terminals, reduce non-productive moves and excess recruitment – and thus reduce truck turnaround time and handling costs.

DMSLOG.Ai is deployed on several ports of major groups, in three different continents, from East-Africa to North America, and our team in the US is waiting for you!

www.dms-logistics.io



Kalmar Global

Kalmar is the global leader in sustainable cargo and material handling for ports, terminals, distribution centres and heavy industry. With our extensive electric portfolio and global service network, we help our customers move towards safer, more eco-efficient and productive operations. Together, we develop innovative solutions that shape the future of our industry, improving our customers' every move.

www.kalmarglobal.com



Moffatt & Nichol

Moffatt & Nichol is one of the largest specialized maritime planning and engineering companies in the world. Moffatt & Nichol has played a major role in the evolution of the modern marine terminal, being one of the first to revolutionize port planning and design with a focus on efficient goods movement, from containerization to automation. Today, we are committed to providing our port clients with innovative solutions to the complex challenges associated with achieving net zero. We have been at the forefront of this global imperative for decades, providing clients with strategies for achieving dockside power, equipment electrification, eco-friendly terminal transport, and local and regional emissions compliance.

www.moffattnichol.com

SPONSORS Continued



SSH Communications

SSH Communications Security is a defensive cybersecurity company with the mission to secure critical data and communications between systems, automated applications, and people. Our products are developed to defend your business secrets and the access to them – now and in the future.

Our company started in 1995 when our founder Tatu Ylönen developed the original SSH protocol, a revolutionary concept that had an immeasurable impact on the adoption of electronic transactions over the internet. SSH's portfolio is focused on data protection, such as PrivX OT, our solution for Access Control between users or applications and industrial automation devices.

www.ssh.com

SILVER CO-SPONSOR



Identec Solutions

At IDENTEC SOLUTIONS we are engineering ideas to improve efficiency in the Industrial Internet of Things. Our wireless solutions keep people safe, make teams work better, deliver valuable insights and eliminate wastefulness – even in harsh environments. That's why the world's biggest and most productive ports, mines, energy operators, automotive suppliers and carmakers trust us to help them better utilise the resources they have. IDENTEC SOLUTIONS is headquartered in Austria with regional offices in Australia, the USA, Norway, Germany and sales representatives in the UK.

www.identecsolutions.com



RPX Optimization

RPX Optimization is a global consultancy focused on helping clients leverage the power of technology and data to transform their operations. We offer a range of services including strategic advisory, terminal planning and design and technology integration. Our team of seasoned industry experts work with clients to optimize their infrastructure, business processes and technology to achieve new levels of performance. We serve clients across the intermodal supply chain including railroads, marine terminals and ports, logistics services providers and governments.

www.rpxoptimization.com



Visy-Oy

Visy is a pioneer in optical character recognition (OCR), applied AI, and deep learning for camera-based automation solutions. Our expertise is based on over 25 years of experience in research and development of industry-leading technology, and we have established a strong positions as one of the top global vendors in gate automation and OCR solutions.

www.visy.fi

BRONZE SPONSORS



BOXBAY

BOXBAY gives the answer to the growing volume of goods traffic in sea ports and presents an opportunity to significantly increase supply chain decarbonization. Its high-bay storage system offers an eco-friendly solution and will set new standards in storage capacity, performance, and the digitalization of ports. Instead of stacking containers directly on top of each other BOXBAY places each container in an individual rack. The storage capability of the terminals is enhanced by stacking containers as high as 11 tiers.

www.boxbay.com



Camco Technologies

Camco Technologies is a pioneer and market leader in container terminal automation. The Camco Technologies image recognition and location tracking solutions register all moves during the container hand-over processes at the gate, in the yard, under cranes and during rail operations. The captured data allows optimization of the terminal processes while the Camco software solutions empower the terminal reaching their digitalization objectives. Our solutions contribute significantly to efficient operations, customer satisfaction and profitability.

www.camco.be



DSP Data & System Planning

DSP is a technological company in the Ports & Terminals industry since 1986. DSP offers a large portfolio of professional services and products to assist ports and terminals throughout the entire process of optimisation and digitalisation. DSP offers worldwide consulting and support services and products around TOS and automation. DSP is qualified to deliver complete N4 implementations including project management, business process mapping, configuration, integrations, training, testing, go live and post go live assistance.

www.dsp.team



Ericsson

Ericsson enables communications service providers and enterprises to capture the full value of connectivity. The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally.

www.ericsson.com/en



Kaleris

Kaleris is a leading provider of cloud-based supply chain execution and visibility technology solutions. Many of the world's largest brands rely on Kaleris to provide mission-critical technology for yard management, transportation management, maintenance and repair operations, terminal operating systems, and ocean carrier and vessel solutions. By consolidating supply chain execution software assets across major nodes and modes, we address the dark spots and data gaps that cause friction and inefficiency in the global supply chain.

www.kaleris.com

EXHIBITORS



AUCOS-Systems

AUCOS-Systems GmbH was founded by Rüdiger Metternich in Buchholz i.d.N. in 2018. AUCOS-Systems is the sole sales company for all the different technical systems developed by RMM, Metternich Mechatronik GmbH, which serve to optimise technical equipment connected with the horizontal transport of containers.

The main product is AUCOS-Coup, the automatic coupling between truck and trailer, which has been in use and at various terminals worldwide and patented since 2010. Another new development worldwide is AUCOS-Lock, the automatic locking of the containers on the chassis. In addition, other components such as AUCOS-Leg are under development.

www.aucos-systems.de

SPONSORS Continued



Refrigerated Transport Electronics (RTE)

At RTE, we help reefer terminal operators efficiently collect, manage, and store reefer data using our industry-leading software and hardware technologies. Our customizable systems meet the needs of discerning terminal operators that require instant access to reefer conditions and the ability to manage temperature settings remotely. These site-based terminal reefer monitoring solutions have been installed in over 80 locations across the globe, ensuring reliability and efficiency for all our clients.

www.rte-usa.com/reefer-monitoring

EVENING DINNER SPONSOR



Rajant

Rajant Kinetic Mesh® delivers robust, mobile-enabled wireless networks in ports that enable them to fully capitalize on the opportunities of industrial IoT, because the network is the assets – enabling full mobility and autonomy.

www.rajant.com

OFFICIAL NETWORKING BREAK SPONSOR



Softtek

Founded in 1982 by a small group of entrepreneurs, Softtek started out in Mexico providing local IT services, and today is a global leader in next-generation digital solutions. The first company to introduce the Nearshore model, Softtek helps Global 2000 organizations build their digital capabilities constantly and seamlessly, from ideation and development to execution and evolution. Its entrepreneurial drive spans 20+ countries and more than 15,000 talented professionals.

www.softtek.com

OFFICIAL BREAKFAST SPONSOR



Portchain

Portchain is the leading provider of berth alignment solutions for container terminals and carriers. Portchain works with leading container carriers and terminal operators to create sustainable win-win solutions to improve operational efficiency for container shipping. Founded in 2017 and based in Copenhagen, Portchain works on a global scale serving container terminals and carriers across Europe, Asia, North America, South America and Africa.

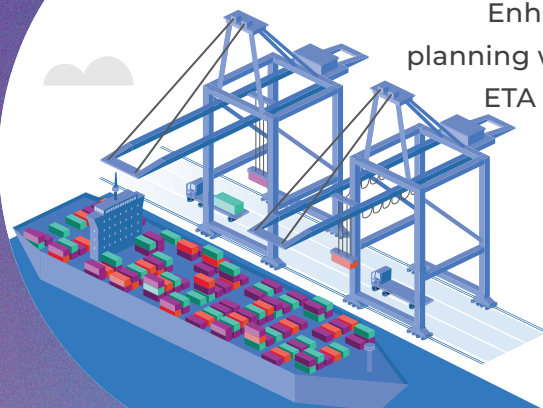
www.portchain.com

AICON Suite of Solutions

combines the power of AI/ML and Operations Research to tackle the pain points resulting from dynamic conditions in container terminals. AICON's intelligent modules optimize operational strategies and provide actionable insights, dynamic decisions, and autonomous workflows to increase efficiencies and profitability.

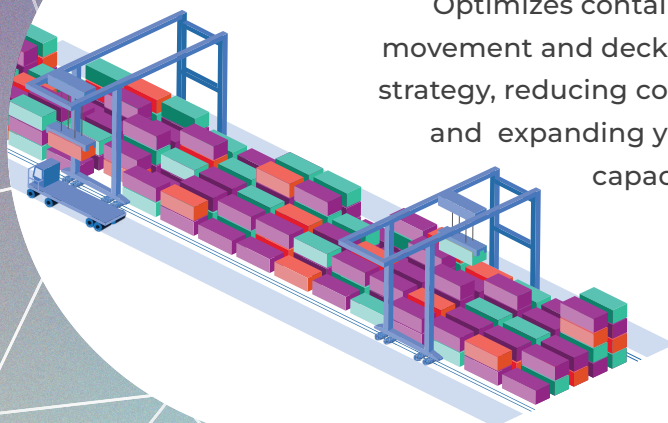
BerthSight

Enhances berth planning with precise ETA predictions, maximizing occupancy rates and revenue.



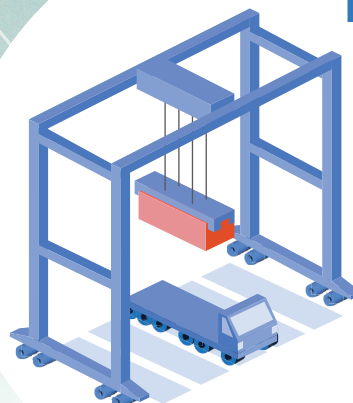
YardSight

Optimizes container movement and decking strategy, reducing costs, and expanding yard capacity.

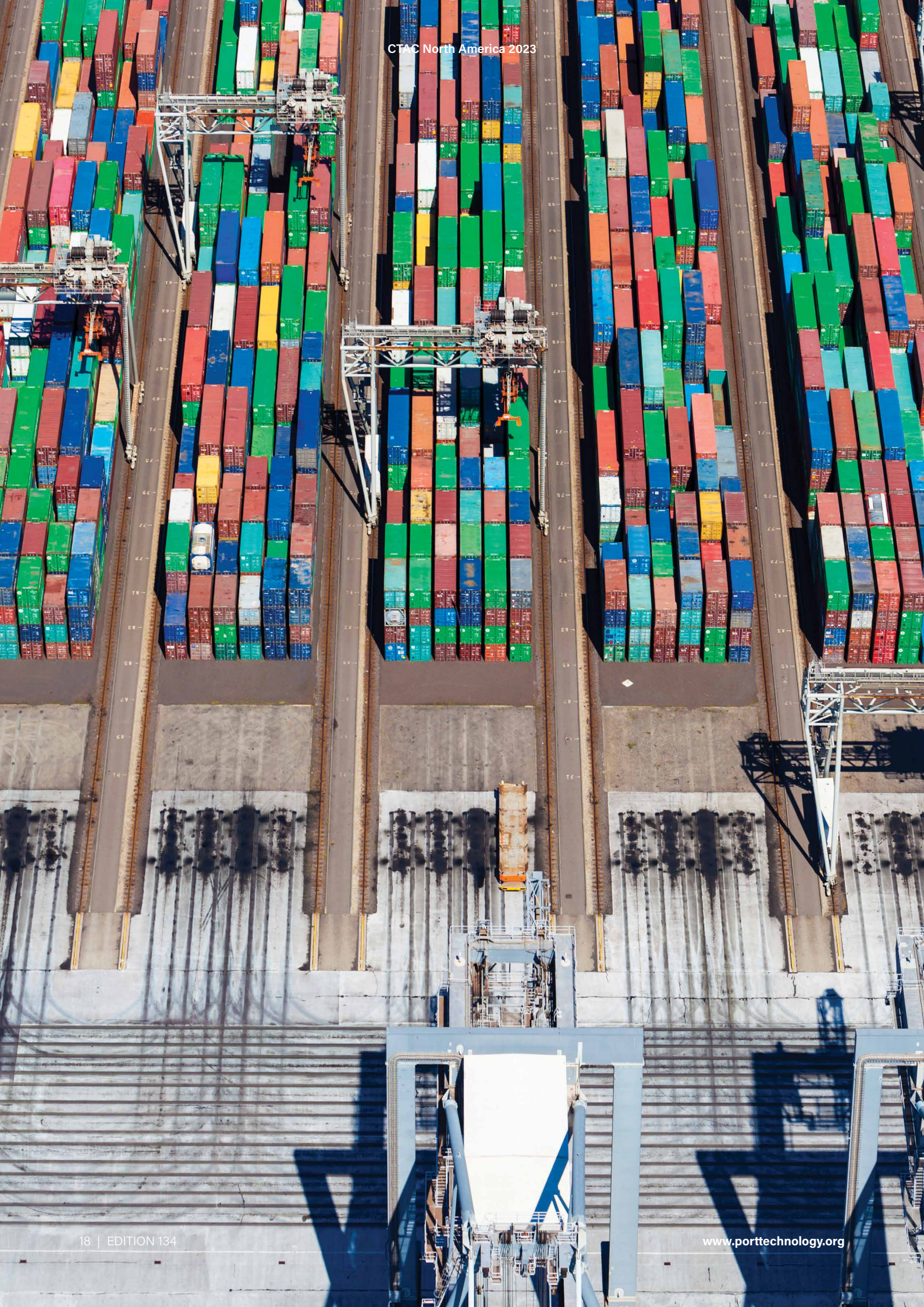


DispatchSight

Manages and controls equipment, optimizing scheduling, dispatching, and routing for efficient resource usage.



Headquarters:
100 Matawan Rd Suite 135
Matawan, NJ, 07747, United States
sales@avlino.com
www.avlino.com



BUILDING A DIGITALIZATION FOUNDATION FOR PORT 4.0





NOKIA

Todd Nate, Head of Private Wireless Sales,
North America, Nokia

Port terminal operators are using digitalization to become more flexible and resilient so they can respond to volatile market demands, shifting transport routes, and growing vessel sizes with greater speed, agility, coordination, and collaboration. To succeed, they need digital-ready connectivity platforms that can enable and optimize advanced Port 4.0 use cases such as autonomous operations, wireless data, worker collaboration, computer vision, and environmental monitoring.

SAFETY AND PRODUCTIVITY ARE THE TOP PRIORITIES

Every terminal operator wants to ensure seamless productivity and maximum safety across the yard terminal. The key to achieving these goals is to support staff communications and collaboration through reliable and secure data and voice applications on a converged private network based on 4G LTE or 5G cellular technology.

With private wireless networks, operators can remotely connect and monitor workers using wearable sensors and connected personal protective equipment (PPE). They can also move on from

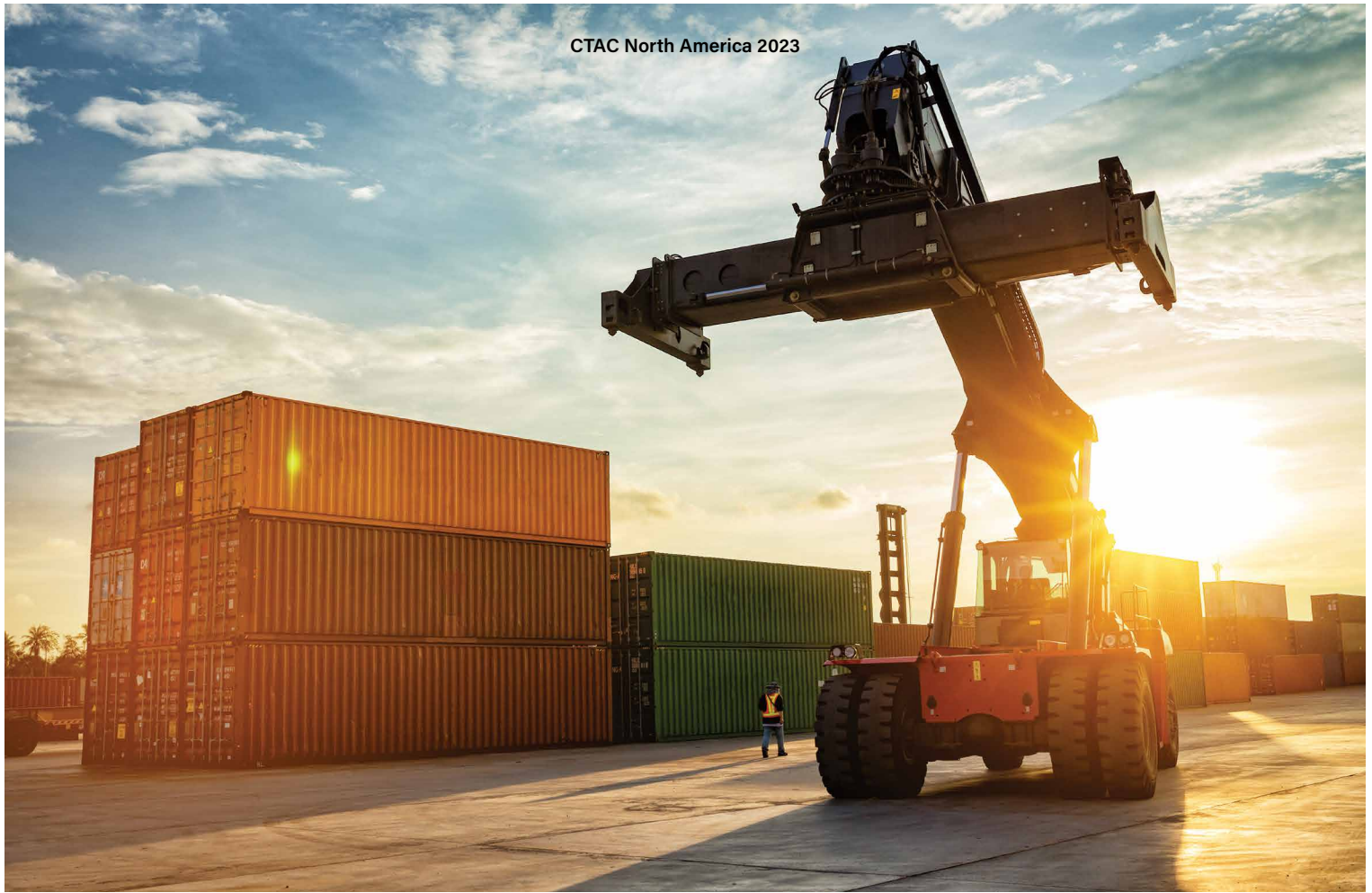


Private Mobile Radio (PMR) and equip workers with dynamic group communications and advanced push-to-talk (PTT), push-to-video (PTV), and group call capabilities. According to Nokia Bell Labs research, terminal operators that replace a patchwork of networks with industrial-grade private wireless connectivity typically reduce their total cost of ownership (TCO) by up to 27 per cent.

Terminal operators can also take advantage of private wireless connectivity to support productivity-boosting applications such as:

- condition monitoring, which can provide real-time insights into the surrounding environment or the quality of goods in containers and facilitate a transition to predictive maintenance;
- real-time asset tracking, which can help improve resource planning and scheduling and reduce inventory loss;
- computer vision and video analytics, which can simplify quality inspections, enhance site security, and identify issues and root causes;

“THE KEY TO ACHIEVING THESE GOALS IS TO SUPPORT STAFF COMMUNICATIONS AND COLLABORATION THROUGH RELIABLE AND SECURE DATA AND VOICE APPLICATIONS ON A CONVERGED PRIVATE NETWORK BASED ON 4G LTE OR 5G CELLULAR TECHNOLOGY.”



- wireless remote control, which can ease the introduction of semi-automated operations for cranes and straddle carriers;
- remote reefer monitoring, which makes it easier to keep track of the temperature and humidity levels in refrigerated containers;
- drone inspection, which provides safer and faster ways to check incoming ships and monitor terminal areas;
- remote technical support, which uses augmented reality (AR) to give workers situated in different site locations instant access to assistance from experienced technicians and trainers.

These applications, connected to the terminal operating system (TOS) through a dedicated wireless network, can guarantee service-level agreements (SLAs) and handle data traffic that supports a range of protocols, including PROFINET or PROFISAFE. They can also increase yard productivity by up to 28 per cent and minimize accidents or injuries by reducing emergency stops by up to 90 per cent.

“MANY PORT TERMINAL OPERATORS HAVE STARTED TO IMPLEMENT INDUSTRIAL-GRADE PRIVATE WIRELESS NETWORKS AND EDGE COMPUTING TO ADDRESS THEIR NEED FOR RELIABLE, LOW-LATENCY, HIGH-BANDWIDTH COMMUNICATIONS.”

HOW WELL ARE PORT TERMINALS POSITIONED FOR INDUSTRY 4.0 SUCCESS?

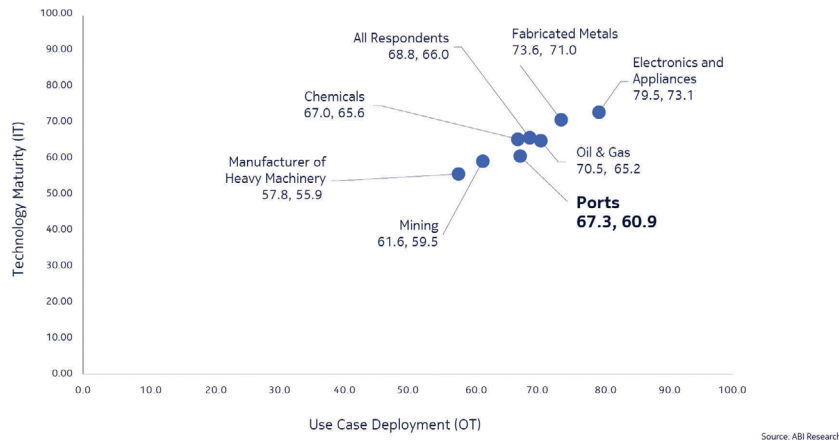
To better understand the current competitive landscape and digital transformation status of the maritime industry, Nokia partnered with ABI Research to survey port operators in five key markets. We also surveyed industrial enterprises across six other industries.

Together, we studied their barriers to adoption, and the degree of alignment between their Information Technology (IT)

infrastructure investments and Operational Technology (OT) use cases underpinned by digital technologies. We aimed to create a maturity index that would help port operators understand how well they are positioned for Industry 4.0 success.

According to our analysis, ports scored 60.9 out of 100 on IT maturity, which covers technology deployments with industrial Wi-Fi, private LTE/5G, edge computing, cloud, ruggedized devices, and management systems. Ports scored 67.3 out of 100 on OT use

Industry 4.0 Matrix Index by Vertical



case deployments, which cover asset performance improvement, operation optimization, worker collaboration, and data analytics. When these two scores are close, there is greater alignment between the IT and OT teams, which will help ports prepare for more challenging demands and achieve their Industry 4.0 goals.

In the OT environment, our survey studied the most common use cases, including equipment and asset performance improvement, operation optimization, data analytics, and work delivery. Port operators generally lag behind enterprises in other verticals in connecting and digitalizing existing assets and operations. They have also been slower to deploy use cases such as autonomous vehicles and Digital Twins, and need to take greater advantage of their IT infrastructure while prioritizing workforce operations and safety. The top OT use cases for port operators are data analytics-driven root cause identification and video-based quality inspection.

In the IT environment, port operators have been rolling out industrial and mesh Wi-Fi and supporting their workforces with

mobile devices. They scored 9 out of 10 in both areas, in line with enterprises in other verticals. Concerning private wireless, port operators scored 7 out of 10 for private 4G/LTE and 3 out of 10 for private 5G. In both cases, they are two points behind other verticals and need to catch up.

We've developed an Industry 4.0 maturity assessment tool that will help you determine how your IT and OT implementation compares with that of other port operators. If you'd like to understand your port's readiness, scan the QR code and try the assessment tool.

AN INTEGRATED PLATFORM TO SUPPORT EXISTING INFRASTRUCTURE

Many port terminal operators have started to implement industrial-grade private wireless networks and edge computing to address their need for reliable, low-latency, high-bandwidth communications. They want solutions that will enable them to fully realize the potential of Industry 4.0 technologies and use cases such as remote-controlled cranes and straddle carriers, camera vision

technologies, and autonomous drones to transform terminals through automation, robotics, and data analytics applications.

Wi-Fi is not optimized for mission-critical applications, but it can complement a private wireless network and help accelerate the digitalization of port terminals. By integrating private wireless with Wi-Fi or aggregating them to support multipath connectivity, port terminals can deploy more advanced use cases that require optimized throughput in difficult radio conditions.

One of our port terminal customers told us that the regular disconnections and packet loss that they experienced over Wi-Fi, which created downtime and impacted productivity, are now a thing of the past. With reliability no longer a concern, they've moved from firefighting mode to focusing on the strategic use cases that will further enhance operations for their customers as well as their IT and OT teams working at the port.

THREE RECOMMENDATIONS FOR PORT TERMINALS STRIVING FOR INDUSTRY 4.0

1. Reconsider the role of Wi-Fi in terminal operations

While industrial Wi-Fi helps port operators connect yard assets and provide basic connectivity for non-critical communications, it has fundamental coverage, latency, security, and reliability limitations that hinder digital transformation. Private wireless is the right choice when it comes to automating cranes and vehicles such as straddle carriers, Ship-To-Shore (STS) cranes, Rubber-Tired Gantry (RTG) cranes, and Automatic Stacking Cranes (ASCs). To take advantage of enhanced capabilities such as low latency and real-time analytics, port operators should consider adopting edge computing and streamlining application connectivity. Existing Wi-Fi can be integrated and aggregated with private wireless to increase



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capacity and throughput for more advanced Port 4.0 use cases.

Husky Terminal at the US Port of Tacoma saw zero packet loss in its recently launched private 4.9G/LTE network, unlike the Wi-Fi network it had previously relied on, which had sporadically dropped connectivity or failed to provide smooth handoffs between access points. This resulted in more than 83 per cent fewer IT support requests, with none of these caused by network-related issues.

2. Explore Digital Twins

Some industrial enterprises have already adopted Digital Twins to simulate key processes and collect real-time insights. Network Digital Twins enable port terminals to monitor their network operations in real time and predict maintenance

needs and potential downtime in advance. Taking things a step further, a Digital Twin is the ideal solution for fully automating yards and processes, ensuring worker safety, and opening a path to the industrial metaverse.

3. Use private wireless to improve ESG performance

A private wireless network reduces energy consumption by up to 84 per cent compared to industrial Wi-Fi because it requires far fewer access points to cover a given industrial site. Streamlining ship-to-shore communications using private wireless, radio, satellite, and microwave technologies reduces idle time for ship anchorage, which mitigates impacts on air and water quality in surrounding environments.

ABOUT THE AUTHOR:

Responsible for the vision, strategy, and execution of Private Wireless Sales in North America, Todd has 25 years of OT experience leading industrials to step-change their operational productivity/efficiency, business model flexibility, and financial position using leading-edge technology. Todd's experiences in creating, motivating, and leading teams that translate complex business drivers into successful technology transformations has given him a unique insight into the trends and dependencies of successful digital transformations. Todd earned his Bachelor of Science in Business at Indiana University and his MBA from Ball State University.

ABOUT THE COMPANY:

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think, and act by leveraging our work across mobile, fixed, and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

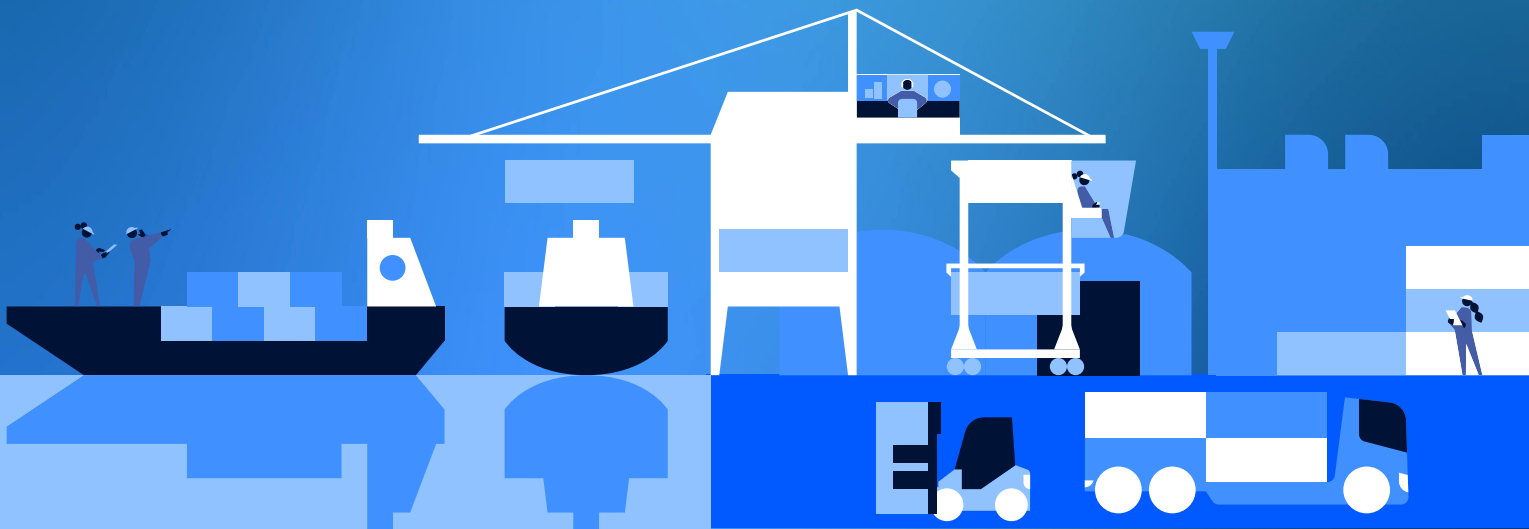
Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable, and sustainable networks today – and work with us to create the digital services and applications of the future.



Simplifying the digitalization of port terminals

Volatile market demands, shifting transport routes and growing vessel sizes pushed port terminal operators to become more flexible and resilient. Learn how Nokia digitalization platform helps enable the demanding use cases at ports.

4G/5G private wireless & Wi-Fi | edge | apps | devices



[Visit us to learn more](#)

THE 'A-WORD' AND OTHER TRENDS SHAPING MARITIME



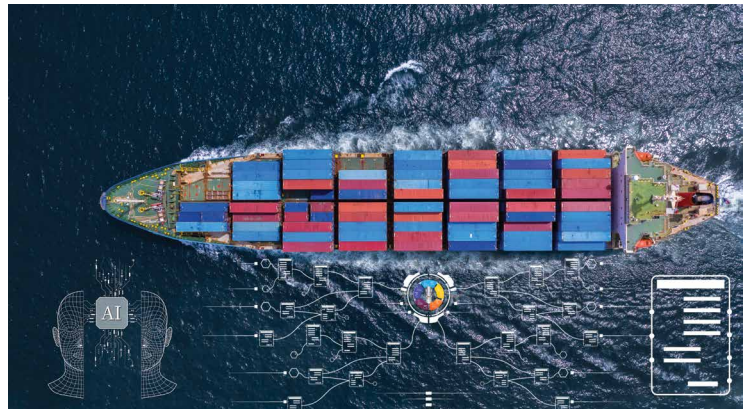


Dr. Eva Savelsberg, Senior Vice President, INFORM, and **Matthew Wittemeier**, Director of Marketing and Sales, INFORM

In 2020, INFORM's Dr. Eva Savelsberg sat down for an interview with Matthew Wittemeier to share her perspective on global trends, technology, society, and environmental issues that were pushing and pulling the global supply chain. At the forefront of the COVID-19 pandemic, many of the trends discussed were accurate. In INFORM's latest article, Eva and Matthew have once again sat down for an in-depth discussion of the state of the industry. This 'teaser' paper covers a small handful of the most pertinent topics discussed. The full interview will be released during PTI's Container Terminal Automation Conference (CTAC) in North America, on 14-15 November.

WHERE IS THE INDUSTRY AT TODAY

When we last spoke, it was at the peak of Covid, or perhaps a bit before the peak of Covid, so a lot happened in the meantime. I think it's always easier to see patterns in the rear-view mirror, but enough time hasn't passed to say definitively where we are from a macroeconomic perspective. If we look back over the past few decades, we had a significant push towards globalization in the '90s. Then, as we all know, in 2008, everything came to a halt. We saw a similar slowdown in the



global economy in 2015, albeit, not as strong but still significant for maritime.

Before Covid, the world was progressing forward, nothing to write home about. When Covid came, as all well know, the world came screeching to a halt. We also saw extreme volatility in the market up and down throughout the pandemic. The industry saw a huge push in volumes throughout 2021 in terms of volume, but as well in terms of reputation. Shipping and the supply chain were being discussed at dining room tables around the world as parents tried to explain why there wasn't toilet paper or pasta at the shops and why the price of timber had tripled in some cases.

Suddenly containers were sexy and neighbors who didn't care about logistics suddenly understood how a container terminal worked and why, as an industry, we were facing so many challenges.

I think today, we don't really know where it will go, because we are not only dependent on having a safe world, having a safe workplace, having safe shipping routes, but also we are dependent on consumer behavior, and I think for the time being, nobody knows if national, much less the global economy will pick up again or slow down as most federal reserves are trying to instigate to combat inflation. In short, we don't know whether the significant rise in eCommerce fueled by Covid and

"TODAY, I THINK WE'VE SEEN THAT AUTOMATION HAS UPSIDES BEYOND JUST COST REDUCTION, AND THAT IT HELPS US, AND THE SUPPLY CHAIN IN GENERAL, TO BE MORE RESILIENT."

“THERE ARE A FEW TOOLS IN THE INDUSTRY AS STRONGLY POSITIONED TO HELP TERMINAL OPERATORS MANAGE DISRUPTION AS ARTIFICIAL INTELLIGENCE (AI) AND ALGORITHMIC-BASED DECISION SUPPORT SOFTWARE.”

Covid lockdowns was a sustained peak that will subside or a steady rise in demand.

That said, there were a lot of lessons hard learned during Covid, and we will never be better positioned to learn from and enact change from those lessons than now. While the industry has slowed down from the Covid peak (which is actually a good thing), it should be seen as the space we need to make changes to processes, procedures, technology, etc. to ensure that we are better positioned for the next peak which is so far proving to be difficult to predict.

AUTOMATION IS THE ‘A-WORD’

What we see at INFORM is that there are a lot of infrastructure projects in the works that were delayed due to Covid. We see a sharp increase in automation conversations again. Covid showed us that the supply chain is an essential element of the global economy. In fact, it showed everyone that it's essential. Your grocery store is never more than 48 hours away from having empty shelves. We need to take steps to ensure that this volatile supply

chain can function as efficiently as possible both with and without humans.

Covid has, in a way, made the ‘a-word,’ ‘automation,’ acceptable again. Before the pandemic, automation was considered a way to reduce costs by removing ‘costly labor.’ Today, I think we’ve seen that automation has upsides beyond just cost reduction, and that it helps us, and the supply chain in general, to be more resilient.

WE REQUIRE RESILIENCY

And that's what we need in the whole supply chain, to be more resilient. We require a higher transparency across the supply chain to be prepared for an unpredictable future. Coming back to the global view, we can't be prepared for every disruption that is likely to hit the industry over the next two decades. Over the past three years, we've seen the industry swing up and down in response to the pandemic, trade wars, actual war, climate disasters, climate change-fueled disruptions, cybersecurity incidences, and geo-political shifts towards the right (which has coincided with stronger

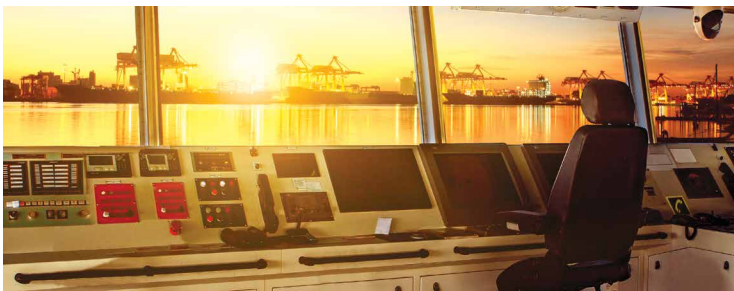
national priority vs. globalization).

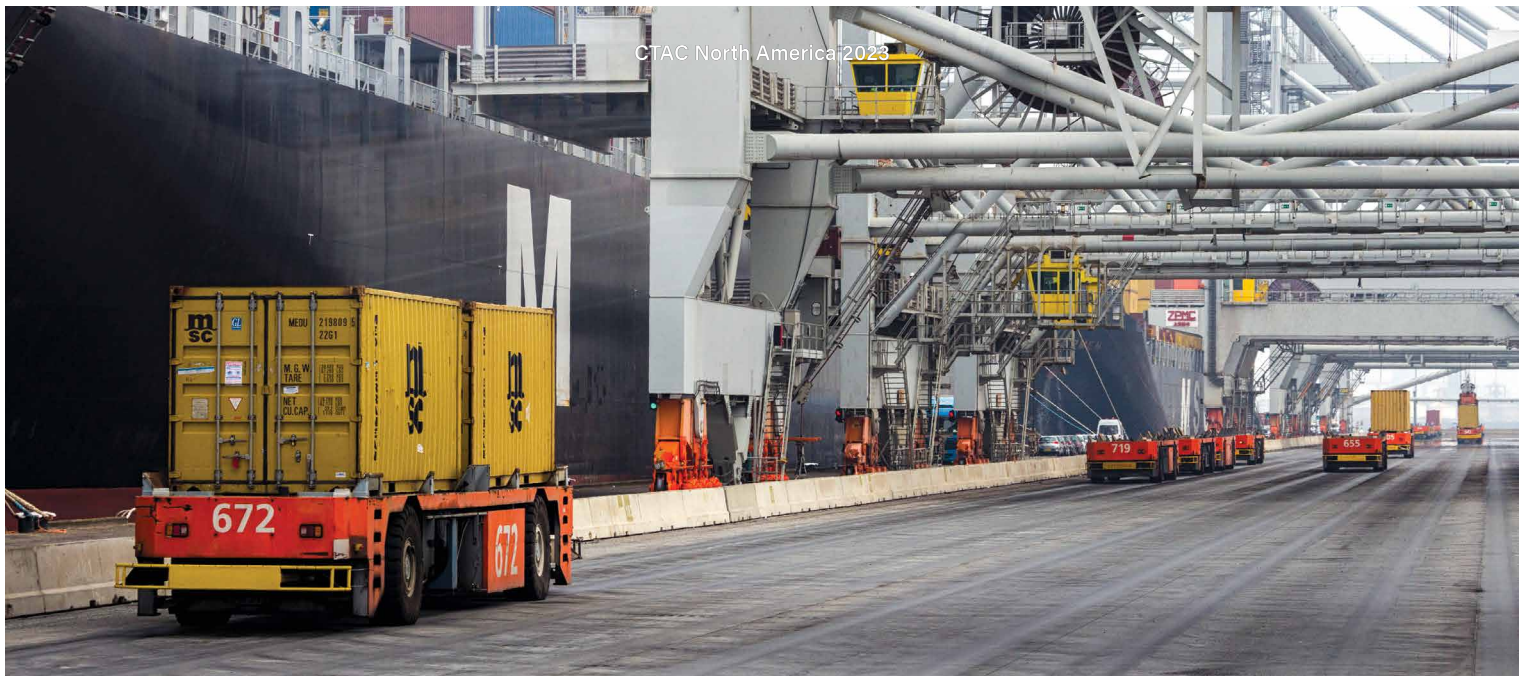
We will of course need to learn to cope with all these major disruptions we are experiencing, which experts mostly agree will only continue to increase in frequency and duration. While it's currently a matter of speculation how these factors will specifically impact the maritime industry, if we look at historical patterns, we can expect a slowdown followed by a sharp rise in traffic that peaks beyond what the nodes in the maritime supply chain can handle at once.

There are a few tools in the industry as strongly positioned to help terminal operators manage disruption as Artificial Intelligence (AI) and algorithmic-based decision support software. By automating decision-making in complex environments, tools like those INFORM has been supplying to the industry for more than 27 years, help terminal operators to shift their focus from routine decision-making to exception handling and managing the complex challenges that lie ahead of us. AI and operations research (OR) based software tools are the fastest way to build resiliency into your terminal operations.

THE SECOND ‘A-WORD’

Technology is evolving around us at a pace unseen before and it will only get faster. I want to look at the new ‘A-word,’ AI. With the rise of Chat-GPT, AI is now front and center in the eyes of people the world over for better or for worse. INFORM presented in 2022 its first update on whether AI is a tool or threat (and will give an update





to that presentation at the CTAC North America conference in its AI keynote). I'm a firm believer that AI is a tool, and as a tool, we decide how it is used. At INFORM, we've seen conclusively that it can help the logistics industry from top to bottom and from side to side.

Let us take machine learning as an example, to get better insights into patterns that happen. But it also helps us to improve how we make future decisions (where we use OR algorithms to make decisions in the now). The decisions that our algorithms make help decisively with terminal operations whether manual or automated. For automated terminals, software-aided decision-making improves automation outcomes full stop. There is no doubt here. We've been proving this for nearly three decades.

Further, AI helps us to reduce the infrastructure footprint, which is very important. It helps operators to be more flexible with the assets they have. When we look at the disruptions discussed earlier, when you have a smaller infrastructure footprint, you are better positioned to not only survive but continue to thrive when the industry slows down. And on the other side, when demands go up and we push towards peak handling, or if irregularities occur, AI can handle those easily.

Customers running our yard optimization solution are routinely operating their yards at 75-85 per cent capacity with much fewer

rehandlers than their peers in the industry allowing them to handle peaks with a high degree of efficiency and flexibility. Think back to the 2021 peaks and ask your operations teams how hard it was to operate the terminals at over 75 per cent capacity. I'm positive the answers won't be good ones.

THE FULL INTERVIEW

INFORM will be releasing the full interview in video format at CTAC North America in November. The complete interview tackles a broad range of topics from climate change and sustainability to the impact of the global North on the current geo-political state of affairs and how these will impact shipping decisively, and a lot more in between. It is worth a watch. Attendees at CTAC in Norfolk will have first access. Don't forget to book your tickets with PTI.

ABOUT THE AUTHORS:

Dr. Eva Savelsberg is Senior Vice President of INFORM's Terminal & Distribution Center Logistics Division and is a member of INFORM's Executive Board. She specializes in AI & Optimization software that renders a wide range of operational processes more productive, agile, and reliable. Eva received her PhD in Mechanical Engineering in 2002 from the University of Aachen (RWTH). She has published five books and over 50 papers on innovation in freight transportation

and is a regular contributor to industry publications and events.

Matthew Witte-meier is Director Marketing and Sales at INFORM's Terminal & Distribution Center Logistics Division where he's become a thought-provoking contributor to many industry publications and conferences. He's co-author of the multi-award winning "2038: A Smart Port Story – a novella about the future of technology and the social challenges it may bring". In addition, he is a member and judge at The Academy of Interactive and Visual Arts (AIVA), as well as having been the senior producer and host of the buzzITtalk podcast and served on the board of YoungShip Rotterdam. He holds a Bachelor of Management and Professional Studies.

ABOUT THE COMPANY:

INFORM specializes in AI and optimization software to improve operational decision-making. Based in Aachen, Germany, the company has been in the optimization business for 50+ years and serves a wide span of logistics industries including ports, maritime, and intermodal terminals. With a broad range of standalone and add-on software modules, INFORM's unique blend of algorithmic-based software expertise, rich industry experience, and big-world thinking delivers huge value for its customers.

More Info: <https://infrm.co/terminal>

Add-on
Optimization
and AI
Empower
Your
Operations.

A collection of 3D cubes in white and light blue, some with labels in teal. The labels include 'YO', 'RS', 'ML', 'VO', 'TLO', and 'CO'. The cubes are scattered across the page, with some appearing to float and others resting on a network of lines and dots.

As add-on solutions to your existing IT and software infrastructure, INFORM's Crane Optimizer (CO), Yard Optimizer (YO), Vehicle Optimizer (VO), Train Load Optimizer (TLO), Rail Scheduler (RS), and Machine Learning (ML) modules add an intelligence layer behind the existing operational layer to support and/or automate decision-making within your terminal.

AI AND DATA PROJECTS IMPLEMENTATION ON TERMINAL. HOW TO SUCCESSFULLY WORK WITH STARTUPS



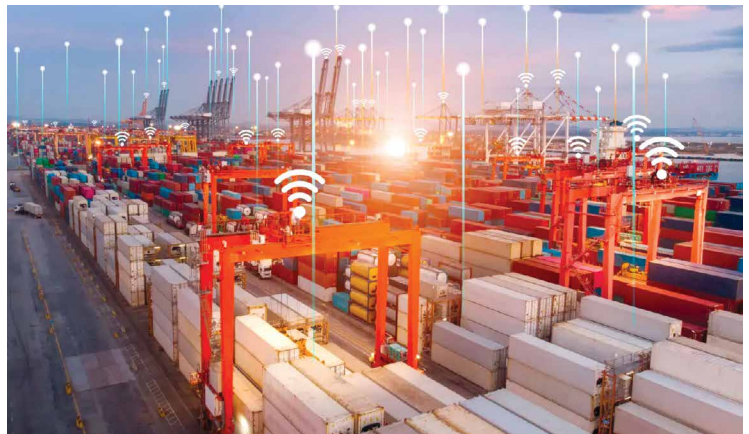
Xavier des Minières,
CEO, DMSLOG.AI

INTRODUCTION

Artificial Intelligence (AI) tools tend to be very expensive to implement. This takes time and requires the availability of an entire IT and operational team to supervise it. The terminal sometimes fears that it does not have the technical knowledge to carry out such a project or that the AI supplier does not have sufficient operational experience. Implementing AI software on top of an already functional, and sometimes automatic, operations management tool is understandably a challenge for those responsible for running a container terminal's operations or IT system. Will the final product meet the expectations set for it?

Although the world of AI is still in its infancy, a stage is reached where data science is truly capable of handling an extravagant number of parameters and classifying them in a way and time no human brain could ever do.

In terms of terminal operations, this means that every operational parameter known by the human operator can be processed for every micro operation in a microsecond. Containers can be placed at the right block at the right moment, avoiding unproductive



moves, or the best possible information can be shared with transporters in real time for their drop-off and pick-up, according to the best possible scenario.

But how can a terminal identify the right provider and bring these innovative projects to fruition?

PROGRESS OF AN AI PROJECT

As these solutions are mostly non-existent or theoretical, it is necessary to assess in advance one's ability to carry out such a project. Indeed, the terminal team will have to support it through process analyses.

Before embarking on an AI project, terminals that remain uncertain about its implementation and wish to ensure the highest quality of data and operational readiness in the field of AI innovation, should consider seeking consulting to get up to speed.

Indeed certain requirements will be necessary to launch the project: an easily accessible data lake, cybersecurity to standards, and the availability of technical and operational teams.

The AI service provider will have to get a complete vision of the terminal's operations to use each

"ALTHOUGH THE WORLD OF AI IS STILL IN ITS INFANCY, A STAGE IS REACHED WHERE DATA SCIENCE IS TRULY CAPABLE OF HANDLING AN EXTRAVAGANT NUMBER OF PARAMETERS AND CLASSIFYING THEM IN A WAY AND TIME NO HUMAN BRAIN COULD EVER DO."



microdata that could influence its mathematical work.

Project management will then involve regular monitoring of the progress of the work of the AI service provider's teams because they must constantly be able to match the modeling of the operations with the reality on the ground.

Therefore, such an implication of the terminal teams forces these projects not to last for years, or it will be necessary to separate them into several phases.

The issues of each terminal, even if they are similar, will differ drastically in the configuration of the system, which is not indefinitely duplicable like a KPI interface or booking system mobile app could be. It is with this configuration task, that the terminal will have to help its AI provider.

At last, the objective is not a simple inventory of practices at

a certain time, but ultra-rapid decision-making in real time on each of the operations. A long-term utilization of an AI tool on a permanent operational issue. The machine learning aspect will allow the algorithms deployed to remain permanently up to date or to integrate new determining parameters to reinvent themselves, making the solution better and better over time. The ideal solution would rely on a subscription pricing model, ensuring that it remains dynamic and adaptable to changing operations rather than becoming stagnant.

SELECTION OF AN AI PROVIDER

Terminals will have several options to choose their AI service provider. Either a large group established in the sector, or a startup specializing in its particular issue. When the terminal

is part of a large group, it can rely internally to develop its solutions.

As the uses of AI are not terminals' core business, it is difficult for large groups to have an available workforce in the long term for the maintenance of an AI tool. On the other hand, they will be able to drive momentum by identifying, qualifying, or supervising optimization projects. Large groups like CMA-CGM or PSA have also launched their internal startup accelerators, which will be able to qualify needs and a use case to organize the work of a startup on their key operations.

Startups are the ideal response to a well-defined need and provide a hyper-innovative solution. Innovation is in their DNA, as they aim to create as fast as possible a reference product for the market. At DMSLOG.Ai for example, the team is made up of 50 per cent

“STARTUPS ARE THE IDEAL RESPONSE TO A WELL-DEFINED NEED AND PROVIDE A HYPER-INNOVATIVE SOLUTION. INNOVATION IS IN THEIR DNA, AS THEY AIM TO CREATE AS FAST AS POSSIBLE A REFERENCE PRODUCT FOR THE MARKET.”

PhD in AI, spread between France and the United States, who work on hyper-specific issues of terminal operations. The AI-powered VBS deployed by DMSLOG.AI in Canada is a benchmark in terms of the use of data for the optimization of truck flows at the terminals and provides permanent, real-time visibility on current and future container flow in the hinterland of the terminal.

However, if innovation will be at the forefront among startups, it is sometimes necessary to support their work on a large group to which the terminal can refer, at least for the integration of the results of the project.

Indeed, engaging a research team carries the risk of the project remaining in the research phase and not being able to utilize the AI-generated results. If the terminal is used to working with a terminal operating systems (TOS) integrator, it will be crucial to involve them in the project from the outset to ensure that the results can seamlessly integrate into the TOS rules.

For instance, when implementing a stacking strategy for import containers, DMSLOG.AI had to work with the terminal TOS integrator to make its results usable directly "machine to machine". This is precisely why large groups and startups should not be pitted against each other.

PERFORMANCE MEASUREMENT OF AN AI SOLUTION

The major challenge is to be able to measure the performance of your solution before and after deployment. The performance will be measured at the modelization stage often in comparison with history, or by running it live in parallel with the creation of a standard case study, which will be used as a reference. Criteria for operational similarities between working days can also be defined to compare the results of a solution with similar operational days in history.

For example, DMSLOG.AI will develop a simulator for the deployment of a resource-planning

strategy that will make it possible to evaluate productivity improvement in real time the productivity and the realistic use case, until the objectives are achieved and the stability of the model is ensured before live deployment.

Once deployed, there is permanent monitoring carried out by the system directly to avoid data drift, with a tendency towards improvement (by definition, algorithms based on learning are refined and have better performance as they collect more new data). If a force majeure were to profoundly modify the modeling parameters, then retraining the model would not be enough and intervention by data scientists would be necessary.

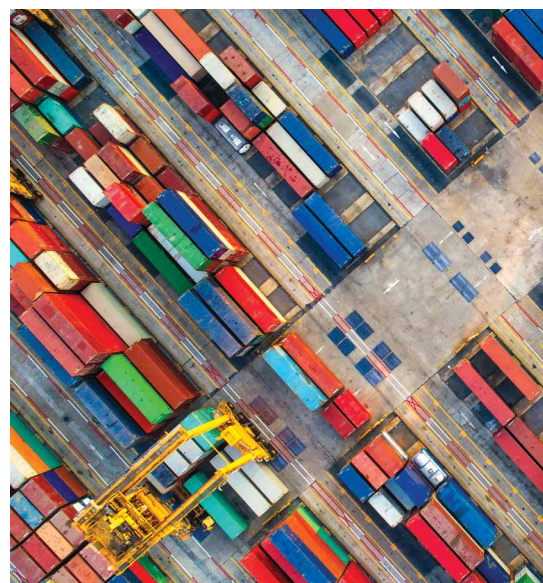
Thus during an AI project, the definition and evaluation of KPIs must be the priority throughout, allowing these projects to be carried out over the long term in good collaboration with the terminal.

CONCLUSION

At the end of the day, everyone thrives by doing what they are good at. Start-ups are at the core of R&D and innovation, while IT majors and TOS providers have a full understanding of each terminal's specific digital environment.

This is where cooperation takes on its full meaning: when they want to launch a data project, terminal operators need not worry about creating a new IT environment but boosting the existing one. While their main IT contractor will keep on running their system, the terminal can supervise dedicated innovation projects. If needed, the complete integration could be implemented by its larger IT partner.

At DMSLOG.AI, the agility and adaptation capacity made partnerships between startups and large groups easy several times, demonstrating the pattern of a thriving cooperation model, all of that at the advantage of innovation for the terminal industry.



ABOUT THE AUTHOR:

Xavier is an accomplished Operations Manager with a global logistics background (last-mile, trucking, shipping).

He is now CEO of DMSLOG.AI, a company he founded 4 years ago.

He holds a Master's degree in Supply Chain Management from Politecnico di Milano.

ABOUT THE COMPANY:

DMSLOG.AI is a startup created 4 years ago operating worldwide to optimize the operations of container terminals.

The company has deployed the most advanced Vehicle Booking System in North America this year, and also other solutions to improve TOS performances.

After a successful first fundraising, DMS opened its first office in the US in 2023.

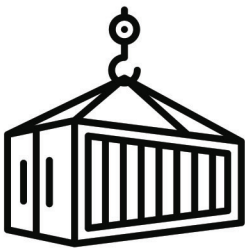
ENTER THE SMART PORT ERA

Use the power of your data to achieve
the best operational performance on
your most critical objectives



DMS

DMSLOG.AI



STACKING STRATEGIES

Inject directly into your TOS a
real-time stacking strategy for
import, export, transhipment



VEHICLE BOOKING SYSTEM

Deploy an AI powered VBS or
improve your existing booking
system by plugging AI capabilities



RESOURCE PLANNER

Size and dispatch the optimal
resources to get the best
productivity on your terminal

KALMAR LEADS THE WAY IN CYBERSECURITY CERTIFICATION FOR THE TERMINAL INDUSTRY

"KALMAR IS THE FIRST SOLUTION PROVIDER IN THE PORTS AND TERMINALS INDUSTRY TO RECEIVE THE CERTIFICATION FOR THE SOFTWARE DEVELOPMENT OF ITS AUTOMATION SYSTEM FOR ALL TERMINAL EQUIPMENT."



Timo Alho,
Director, Product Management Automation, Kalmar

In August 2023, the Kalmar Technology and Competence Center in Tampere, Finland, and its Automation Business Line received certification for IEC 62443-4-1, the international standard for cybersecurity for industrial automation and control systems. Kalmar is the first solution provider in the ports and terminals industry to receive the certification for the software development of its automation system for all terminal equipment.

Industrial automation and control systems have a direct effect on the physical world, while cybersecurity incidents can lead to financial, health, safety, and environmental impacts. Potential threat scenarios range from data security breaches and ransomware attacks to the theft of goods and even shutting down the operations of the entire port. Attacks may be carried out by various types of entities, including

individual hackers, organized crime, and state-level actors. Due to the critical role that ports and terminals play in global supply chains, any security incidents can have serious consequences for the terminal operator, customers, and society at large.

IEC 62443-4-1 is an industrial standard that defines Secure Development Lifecycle (SDL) requirements and practices related to the development of products. The certification of the Kalmar One automation system to the standard demonstrates Kalmar's commitment to ensuring the highest level of security for its products and solutions. SDL includes practices such as security requirements definition, security training, secure design, secure implementation, verification and validation, defect management, patch management, and product end-of-life.

SECURING THE DEVELOPMENT PROCESS

The Secure Development Lifecycle process of the Kalmar One automation system underwent an independent audit conducted by leading product certification company Exida, [click here](#) to see the Exida, Kalmar One Cybersecurity certificate and assessment report. The process met the requirements of maturity level 3 of the IEC 62443-4-1 standard.

Achieving this maturity level demonstrates that the organization has implemented a structured approach to industrial cybersecurity and is committed to improving its security capabilities. The processes have been practiced, and evidence exists to demonstrate that this has occurred.





To address cybersecurity in Kalmar One, we started implementing the security practices of the standard into our software development. We integrated several security tools into our software development process to provide enhanced visibility of what is going on under the hood of our product, and to reduce attack surfaces. We enforced mandatory security training courses for both software developers and testers and the onboarding process includes the courses.

LEADING BY EXAMPLE

The IEC 62443-4-1 standard does not define specific features in end products but is designed to help companies improve cybersecurity by improving the software development process and addressing best practices in managing the entire lifecycle of the software product. By following the IEC 62443-4-1 standard, companies can ensure that products and solutions are designed, developed, maintained, and retired with security in mind. The standard will also help Kalmar fulfill essential health

and safety requirements in the new Cyber Resiliency Act and Machinery Regulation of the European Union.

We are proud to be the first in the automated terminal industry to achieve this certificate for our product development process. Customers using our Kalmar One automation system can have the peace of mind of knowing that not only do they have access to the latest patches and updates to ensure the security of their systems, but also that the tools they use have been developed with the best practices available to the industry.

ABOUT THE AUTHOR:

Timo is the Head of the Product Management in Kalmar's Automation Business Line, part of Cargotec, a global leader in cargo handling solutions.

Timo has worked at Kalmar for almost 25 years, first in automation R&D, where his key project was the development of the AutoStrad solution. During the past years, he has held various positions in the terminal automation business from Product Management to the Head of the Cranes Business line and Terminal Design Services team.

He has been involved in most of the terminal automation projects by Kalmar. Currently he leads the Product Management function in Kalmar Automation business line, responsible for automation offering for all Kalmar products.

Timo has studied automation engineering (M.Sc., Automation Technology) at the Tampere University of Technology.

ABOUT THE COMPANY:

Kalmar is the global leader in sustainable cargo handling for ports, terminals, distribution centres and heavy industry. With our extensive electric portfolio and global service network, we help our customers move towards safer, more eco-efficient and productive operations. Together, we develop innovative solutions that shape the future of our industry, improving our customers' every move.

www.kalmarglobal.com

Kalmar is part of Cargotec. Cargotec's sales in 2022 totalled approximately EUR4.1 billion (\$4.99 billion) and it employs around 11,500 people.

www.cargotec.com

Kalmar SMARTPORT



SmartLift



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Make your next move a smart one.

Kalmar SmartPort offers a range of modules that can help improve the operational efficiency and safety of your operations, helping you to track, route, and manage containers from the gate to the quayside. Optimizing operational productivity, lowering costs, and helping you to meet local regulations. Now that's smart.

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KALMAR



A PRIVATE CELLULAR BUYERS' GUIDE: THE ESSENTIALS OF BUILDING A PRIVATE 5G OR LTE NETWORK

HOW PORTS AND TRANSPORTATION HUBS LEVERAGE PRIVATE CELLULAR
NETWORKS FOR IMPROVED CONNECTIVITY, PERFORMANCE, AND SECURITY




ERICSSON

OVERVIEW

Our supply chain is increasingly adopting modern technologies, connected devices, and the data-rich, highly actionable business insights they enable. Even the largest and most challenging environments need the flexibility of wireless connectivity to connect those devices and leverage their data. But in some cases, existing network technologies, including Wi-Fi solutions, aren't optimized to address this challenge because:

- The sheer size and scope of many deployments demand long-range coverage, and the number of Wi-Fi access points needed to cover that range isn't feasible.
- Business-critical devices and highly sensitive information call for layers of security unavailable within Wi-Fi networks alone.
- Applications such as live streaming of HD video footage require dedicated bandwidth and low latency.
- The broad scope of what organizations connect puts a premium on the ability to easily monitor and control network traffic flow, and Quality of Service (QoS).

When we consider everything big and small that can now be Internet-connected, the boundless potential of 5G adds expanded opportunity to the long term vision of ports and shipping businesses. With a private cellular network, new efficiencies, operational models, and business cases can be built upon the underlying premise that seamless, secure, and



“IN SPRAWLING AREAS WHERE WIRELESS CONNECTIVITY IS CRITICAL, PRIVATE CELLULAR NETWORKS HAVE EMERGED AS AN OPTIMAL OPTION.”

frictionless connectivity can be assumed across all people (dock workers, seafarers, passengers), places (ports, warehouses), and things (vehicles, ships, cranes, devices), at all times.

In sprawling areas where wireless connectivity is critical, private cellular networks have emerged as an optimal option. Private cellular networks, which include both private LTE and private 5G deployments, are helping organizations with locations that require wireless connectivity but are not well supported by current wireless infrastructure.

Private networks play a unique role in wireless networking, providing benefits that range from

increased coverage, capacity, and mobility, as well as enhanced security and reliability.

ADDRESSING THE CHALLENGES OF SECURE NETWORK COVERAGE IN LARGE AREAS

Across cities, campuses, and other facilities, Wi-Fi is an excellent tool for connecting a multitude of devices. However, for organizations like ports that oversee operations across vast, sprawling areas and/or rapidly changing spaces, Wi-Fi alone can be challenging, if not untenable. Private cellular networks can help port operators address challenges associated with relying solely on Wi-Fi or public cellular.

COSTS

Many large logistics hubs and industrial sites like ports can now deploy Internet of Things (IoT) sensors and equipment capable of machine-to-machine (M2M) communication, all of which require reliable connectivity. Unfortunately, laying fibre in the ground and installing a huge quantity of Wi-Fi access points is exceptionally expensive. Outfitting just one large site could cost millions of dollars for the fibre alone.

The infrastructure needed for a private cellular network can be considerably less expensive than a widespread Wi-Fi deployment. Whereas dozens of Wi-Fi access points with extensive wired line installation would be required in a big area, a local area network (LAN) based on cellular broadband would call for just a few private cellular network radios.

Keeping high-bandwidth content on site with a private cellular network and local servers can increase data security and reduce data plan costs. While public service providers may charge per device and per data usage, private network owners can avoid those recurring fees.

PERFORMANCE AND RELIABILITY IN PUBLIC AND PRIVATE NETWORKS

Private cellular networks have proven to be excellent wireless networking options in both backup (failover) and primary roles, depending on the use case. However, in certain scenarios, public cellular doesn't provide the cost-efficient, unwavering high performance needed to keep business-critical applications running smoothly around the clock.

For instance, many enterprises operate sites that gather and pass huge amounts of data, including a lot of information that is pushed to the organization's data centre.

This traffic encounters increased network latency and



drives up data costs when carried via a public LTE or 5G network with pay-per-bit pricing.

Organizations that rely on Wi-Fi for connectivity may still encounter performance limitations when supporting the types of high-bandwidth applications that are becoming standardized in most business operational situations, especially across vast areas. Examples include automated guided vehicles (AGV) and real-time video surveillance streaming.

One significant cause of Wi-Fi deficiency is when portable user equipment such as a phone, tablet, or IoT device clings to a Wi-Fi connection even when it has no actual coverage — a phenomenon known as “sticky Wi-Fi” or “sticky client.” Through the prioritization and preemption orchestration capabilities of a private cellular network, the organization controls the connections between access points (APs) and user equipment, resulting in better coverage flexibility and overall reliability.

SECURITY

In many cases, Wi-Fi security is limited to a username and password, which may be acceptable for logging in at a coffee shop but concerning within the framework of a large organization's network. While Wi-Fi 6 has made improvements, the presence of sensitive data and critical IoT devices underscores the need for additional layers of security. Altogether, these factors give private cellular inherent security advantages over other wireless infrastructures and help protect an organization's most critical information from malicious attacks.

Private 5G and LTE deployments include SIM/eSIM authentication and edge devices, offering additional layers of security through encryption that Wi-Fi cannot provide. Additionally, the network architecture of private 5G or private LTE usually includes on-site servers, enabling organizations to keep traffic between IoT devices and corporate servers on their internal network rather than routing it through the public network.

HOW PRIVATE CELLULAR NETWORKS WORK

Businesses and ports today are increasingly becoming familiar with the process of using cellular-based connectivity for wireless wide area networks (WAN) — whether for primary links, failover, or augmentation. However, turning LTE or 5G into wireless local area networks (LAN) is uncharted territory for many organizations.

Placing cellular access points on-site allows companies to mimic a standard public cellular network while gaining control and visibility of the devices and applications on their network. This creates a purpose-built wireless network that provides the reliability, high-performance, security, and cost-efficiencies required to support business-critical applications.

Private networks can be installed in various ways: by either a third-party network provider, a traditional

cellular operator, or the enterprise customer itself. The decision of which operator or infrastructure provider to use mostly hinges on the spectrum of choice and the level of network management the enterprise is willing to undertake to gain cost savings and control over its digital infrastructure.

WHAT DO PORTS NEED TO BUILD A PRIVATE CELLULAR NETWORK?

For the successful implementation of a high-performance, high-capacity private cellular network throughout an enterprise, IT teams must be familiar with the components that bring the network to life. On top of that, it's important to recognize that when each component is developed and deployed by a single vendor, the resulting unified solution gives users the ability to orchestrate their network within a single management platform.

SPECTRUM USED FOR PRIVATE CELLULAR NETWORKS

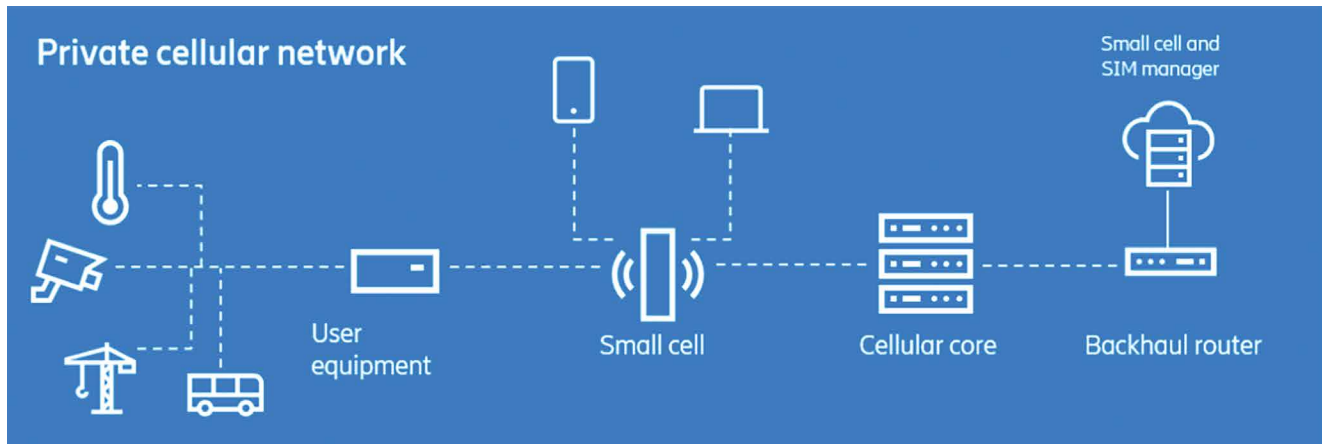
Licensed: This enables carriers, such as your mobile service provider, to operate private cellular networks for enterprises as a managed service. Alternatively, enterprises can deploy their own private cellular network using spectrum licensed by carriers. In some countries, such as Germany, industry spectrum serves as another licensed spectrum option.

Shared: Enterprises can operate private cellular networks in a spectrum owned by others. For example, enterprises in the US can use Citizens Broadband Radio Service (CBRS), which leverages up to 150 MHz of interference-free spectrum.

Unlicensed: Enterprises or carriers can operate LTE or 5G networks in unlicensed spectrum and use carrier aggregation to augment capacity for their networks.

“PRIVATE CELLULAR NETWORKS HAVE PROVEN TO BE EXCELLENT WIRELESS NETWORKING OPTIONS IN BOTH BACKUP (FAILOVER) AND PRIMARY ROLES, DEPENDING ON THE USE CASE.”





PARTS OF A PRIVATE CELLULAR NETWORK

- **Cellular core:** The cellular core, also known as the evolved or converged packet core, is the brain of the private cellular network. This is where policies are set to determine which devices can access the network and how traffic can move throughout the network.
- **Cellular access points:** The cellular access point (CAP), also referred to as part of the radio access network (RAN) or a small cell, is used to provide access to the network for SIM-enabled edge devices such as laptops, IoT sensors, surveillance cameras, tablets, and more. This is similar to how a Wi-Fi access point connects TVs and printers to an in-home Wi-Fi network.
- **Endpoints and private SIMs:** A SIM card, whether physical or embedded, is required to gain access to the network and for authentication to the private 5G or LTE cellular. This step is necessary before connected devices, including cameras, autonomous vehicles, or IoT sensors, can become part of the network.
- **Network management tools:** A single dashboard provides real-time visibility and control over the private cellular network. This is crucial for configuring, monitoring, and troubleshooting the network from anywhere, gaining access to key insights, and simplifying network maintenance.

FIGURE 1 (ABOVE)

Connecting wireless devices with a private cellular network

WHEN AND HOW ORGANIZATIONS USE PRIVATE CELLULAR

The benefits of private LTE and private 5G are capturing the interest of ports and other organizations that have large areas filled with lots of moving devices and applications that must be connected at all times without exception. These situations often involve the gathering and sharing of sensitive data between devices and servers. When Wi-Fi or public cellular are less than ideal or even possible, a private cellular network can address needs in several key areas:

Vast areas with complex networking needs

In large spaces with extensive network requirements and hundreds of users and devices, private cellular networks help prevent congestion and are much less expensive to set-up and maintain compared to Wi-Fi.

High-bandwidth traffic within budgetary limitations

Organizations looking to connect many video surveillance cameras could use public LTE or 5G, but associated data usage would likely be cost-prohibitive. Private cellular can offer a much more cost-effective option.

“PRIVATE 5G PROVIDES A CONNECTIVITY PLATFORM THAT ENABLES PORTS TO MANAGE AND SECURE ALL THEIR IOT AND CONNECTIVITY-DEPENDENT TECHNOLOGIES ON A SINGLE WIRELESS NETWORK.”

Remote locations lacking wireless infrastructure

In places where carriers have yet to establish wireless infrastructure, organizations can easily set up a private cellular network to use as their wireless LAN.

Constant connectivity for applications on the go

Mobile use cases, such as connected workers, AGV, asset monitoring, and more, require a connection that can move with them. Private cellular networks give users control over connectivity and Quality of Service (QoS), virtually eliminating client stickiness that can cause interruptions and even downtime.

Critical information

In certain scenarios, the transmission and storage of highly sensitive information are unavoidable, making them attractive targets for hackers.

Ports can keep business-critical information on-site via a private cellular network, which enables additional layers of security beyond what Wi-Fi alone can provide. With private 5G, it's possible to prioritize

network segments dedicated to serving critical or highly sensitive processes, to avoid interference or varying network availability even during peak network usage.

Given the ubiquity of IoT and connectivity-dependent technologies, private LTE and private 5G are relevant solutions in most industries. The ability to set up a wireless LAN that is significantly higher performing, more reliable, flexible, cost-effective, and secure than Wi-Fi or public cellular alone meets the specific needs encountered in many use cases.

COMMON USE CASES FOR PRIVATE CELLULAR NETWORKS IN PORT AND TERMINAL OPERATIONS:

- High-definition surveillance cameras
- Predictive maintenance
- Automated guided vehicles (AGVs)
- Automated mobile robots (AMRs)
- Asset management
- Crime and environmental monitoring
- Video surveillance

REALIZING THE VALUE OF PRIVATE CELLULAR NETWORKING

Interest in private LTE and 5G is growing, as global ports see a rapid increase in the volume of devices, technologies, and workers that require reliable connectivity for optimal productivity, along with an increasingly critical need to keep their data and digital infrastructure secure.

At Ericsson, we have taken our extensive portfolio and experience with cellular service providers and built a compact, easy-to-manage private network solution for industries including transportation and maritime ports. We can connect the smallest to the most advanced use case, by bringing niche cases to our extensive partnership table and determining how to execute different collaborations successfully. [Our ecosystem](#) includes a wide range of industrial partners, enabling us to address our customers' unique issues.

Discover how we are helping ports overcome connectivity challenges with private network solutions using LTE and 5G at www.ericsson.com/ports.

Explore private cellular network solutions across industries undergoing digital transformation at www.ericsson.com/en/private-networks

ABOUT ERICSSON:

Ericsson enables communications service providers and enterprises to capture the full value of connectivity. The company's portfolio spans Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses and is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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NAVIGATING SEAS OF DATA

"THE MODERN CHALLENGE FOR STAKEHOLDERS IN CONTAINER SHIPPING IS TO NAVIGATE HUGE AMOUNTS OF INFORMATION FROM DIFFERENT SOURCES SHARED IN MANY DIFFERENT FORMATS FROM EMAILS, PHONE CALLS, SPREADSHEETS, DOCUMENTS, AND LEGACY DATA SYSTEMS."



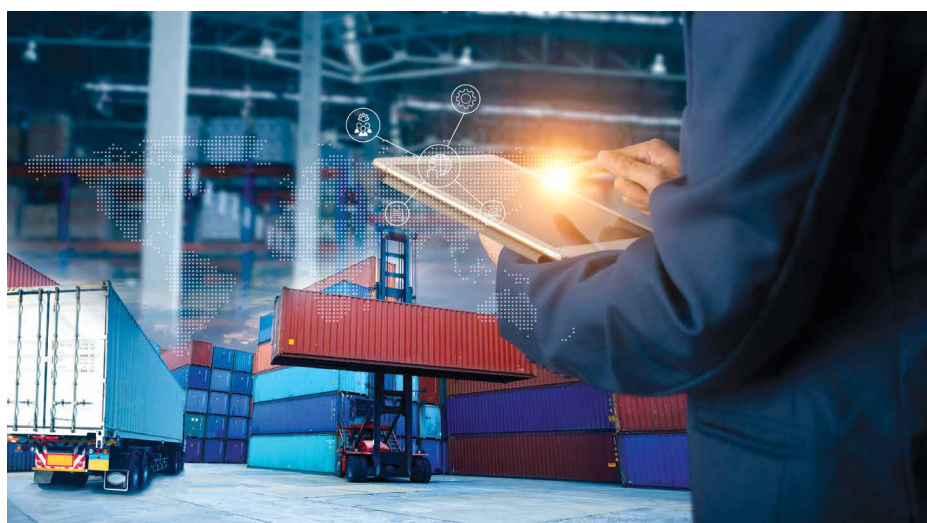


PORTCHAIN

Dr. Jasper Boessenkool,
Senior Director Sales, Portchain

In today's fast-evolving container shipping industry, the challenge is not a lack of available data but the huge amount of unstructured data sources. In the past, the container shipping industry might have faced challenges due to low digitization and limited data availability. However, in today's modern supply chain, each stakeholder is both dependent on multiple data sources and generating crucial information for others in the ecosystem. A container terminal, for instance, must piece together various sources of information to accurately plan upcoming port calls, e.g., schedule information from carriers, AIS data (vessel position) to assess potential delays, (estimated) time of completion at the previous port, cargo bookings, etc. Similarly, that same container terminal provides crucial time stamps and updates to carriers and others in the ecosystem on (estimated) time of departure, time window to deliver export cargo, potential congestion, and waiting times. In other words, "ports are developing into digital nodes as vital parts of an increasingly digital supply chain ecosystem." ¹ (Lind & Lehmacher, 2023).

The modern challenge for stakeholders in container shipping is to navigate huge amounts of information from different sources shared in many different formats from emails, phone calls, spreadsheets, documents, and legacy data systems. For instance, vessel's arrival time, duration of the port stay, and time of departure are crucial data for all stakeholders to manage schedule reliability,



ensure Just-In-Time arrival, minimize congestion, and avoid waiting times. This paper argues that there are two important factors to drive operational efficiencies in container shipping:

1. Transparency and willingness to share data.
2. Collaboration and alignment to create a 'single source of truth'.

Furthermore, we show that data platforms, such as Portchain, can facilitate alignment across the supply chain to enable operational efficiencies. Industry platforms can serve as an effective method to bring together and validate multiple data sources to create a single source of truth. Based on this aligned data, container terminals, carriers, and other stakeholders can optimize their own processes and collaborate to optimize across the supply chain.

THE QUEST FOR A SINGLE SOURCE OF TRUTH

First, transparency and a willingness to share data is an important step to improve efficiency. In container shipping the arrival time of a vessel, duration of the port stay, number of load and discharge moves, and the departure time are essential pieces of information to plan a port call. For terminals, it is essential to plan the most efficient lineup of vessels and for carriers, it is important to plan the most efficient sailing speed to save fuel and avoid waiting times at the terminal. However, the multiplicity of data – where multiple sources provide conflicting narratives – presents a formidable challenge. Digitization has improved over recent years, but "approximately 80 per cent of ports still rely on manual, legacy solutions." ² (Heikkilä, Saarni & Saurama, 2022). Even within one organization there might be



“DATA PLATFORMS, SUCH AS PORTCHAIN, CAN FACILITATE ALIGNMENT ACROSS THE SUPPLY CHAIN TO ENABLE OPERATIONAL EFFICIENCIES.”

conflicting views on the potential arrival time of a vessel. For example, a carrier might issue a coastal schedule with estimated times of arrival from their central planning office that differs from estimates made by the local planning team that takes into account specific local conditions.

Essential scheduling information might be available in multiple internal legacy systems or silos of data. Synthesizing data sources and sharing it with all stakeholders is important to create data transparency as “timely information about potential delayed arrivals and departures is critical for planning and preparation which requires that everyone in the supply chain network keeps others constantly informed.”¹ (Lind & Lehmacher, 2023).

Second, collaboration and alignment are essential to create one source of truth. It is not sufficient to synthesize information within one organization, but also to combine and align data between different stakeholders. Carriers

and terminals each have important pieces of the information puzzle. Carriers will decide vessel rotation and sailing speed that directly impact the estimated time of arrival of the vessel in the port.

Terminals know their available capacity and have information from competing carriers and decide when the vessel can berth. Similarly, carriers will have better information on the number of discharge moves, whereas terminals might have more up-to-date information on the load moves close to arrival from cargo that has arrived at the yard.

Therefore, carriers and terminals must collaborate to improve the port call process and align scheduling data. “Ports are platforms (hubs) for activities that require stakeholder collaboration [...] These stakeholders create networks and ecosystems for data sharing. [...] In order to achieve maximum benefit from digitalization and data, the gathered data should be made available to all the relevant

parties”³ (Brunila Kunnaala-Hyrkki & Inkinen, 2021).

PORTCHAIN COLLABORATION ON THE US GULF AND EAST COAST

Data platforms offer an efficient approach for aggregating and validating multiple data sources to create a single source of truth.

“The data management and the synchronization could be organized on neutral global platforms (one or more that are ideally interconnected) to which all actors are connected. Providers would ensure data security and system integrity. The digital platforms would be connected to port and vessel systems.”⁴ (Lind & Lehmacher, 2022).

Platforms, such as Portchain, can facilitate alignment across the supply chain to enable operational efficiencies.

Leading container terminals such as **Port Houston** on the US Gulf Coast and **South Carolina Ports** on the US East Coast joined Portchain’s cloud-based platform to improve the berth alignment process. Terminals and carriers share essential data and updates on upcoming port calls on a secure platform. The digital berth alignment process replaces the cumbersome, manual data exchange and streamlines the scheduling process improving quality and timeliness of data. Portchain has automated integrations with both carrier planning systems and the terminal berth planning or terminal operating system. These integrations on both sides ensure data is available in real time and updates are automatically and immediately shared with the other party.

The platform provides a single interface and a formal place to share scheduling data. Furthermore, it provides contextual information such as embedded AIS data (vessel position), a shared changelog, and an automated timestamp if a vessel departs from the preceding terminal.

“Automated data exchange and digital collaboration save time and effort and improve the berth

"AUTOMATED DATA EXCHANGE AND DIGITAL COLLABORATION SAVE TIME AND EFFORT AND IMPROVE THE BERTH SCHEDULING PROCESS."



scheduling process," said **Mike Shaffner**, Director Operations Planning and Technology, **Port Houston**.

A single platform also allows both parties to validate data to achieve higher data accuracy, e.g., comparing planned and predicted values or identifying misalignments or errors from both sides. South Carolina Ports has digitally connected more than 700 users from 36 companies to create transparency on their berth scheduling. Port captains use the information to check if the information regarding their vessel is correct, keep an eye on the vessel lineup in the coming days, monitor potential congestion, and assess if there are any risks of delays. This improves collaboration and allows each user to optimize their workflow.

"We aim to create transparency and efficiencies across the supply chain so that each stakeholder can optimize their own processes," said **Barbara Melvin**, CEO, **South Carolina Ports**.

CONCLUSION

The modern supply chain ecosystem is intricately interwoven with data from different stakeholders. Each stakeholder needs to triangulate and validate data from various sources for efficient operations and data-driven decisions. Transparency and

sharing of data are essential to build trust, e.g., a delay in the preceding port might impact the vessel's arrival time in the next port. Platforms, like Portchain, can facilitate collaboration by bringing together scheduling data from both terminals and carriers. By integrating both the carrier's scheduling system and the terminal (berth) planning system, platforms improve data quality and timeliness of scheduling data. Data sharing platforms, like Portchain, enable terminals and carriers to embrace the best of both worlds - the richness of data diversity and unwavering confidence in a single source of truth - as they navigate the intricate waters of a digitized shipping industry.

ABOUT THE COMPANY:

Portchain is a software provider of berth alignment solutions for container terminals and carriers. Portchain works with leading container carriers and terminal operators to create sustainable win-win solutions to improve operational efficiency for container shipping.

Portchain Connect is a digital platform enabling terminals and carriers to share and receive trusted data and reduce delays in information transmission. Portchain Connect provides users with an easy-to-use overview of all their vessel calls and ensures they can securely transfer berthing information, remove the

costs associated with manual non-digitized communication, and align on berthing windows to improve schedule reliability.

ABOUT THE AUTHOR:

Dr. Jasper Boessenkool is an accomplished leader in innovation, technology development, and strategic business development. He has over 20 years of experience in technology, strategy, and innovation and more than 10 years in the shipping industry. Currently, he is Senior Director Sales at Portchain focusing on terminal and carrier collaboration.

Throughout his career, Jasper worked in different strategic positions building interdisciplinary teams on innovation and strategy. He has a track record of translating technology developments into business opportunities to drive growth and transformation. Jasper has a background in physics and holds an MSc and PhD in Physics from Utrecht University in the Netherlands.

REFERENCES

1. "The port as a digital node" by Lind & Lehmacher - Port Technology International 131-2023.
2. "Innovation in Smart Ports: Future Directions of Digitalization in Container Ports" by Heikkilä, Saarni & Saurama - Journal of Marine Science and Engineering 2022.
3. "Hindrances in port digitalization? Identifying problems in adoption and implementation" by Brunila, Kunnaala-Hyrkki & Inkinen - European Transport Research Review 2021.
4. "An Expanded JIT Approach" by Lind and Lehmacher - Marine Technology 2022

MINIMISED AGV APRON. A SUSTAINABLE APPROACH TO WATERSIDE OPERATIONS





portwise

Jeroen Kats, Project Director, Portwise

Automatic guided vehicles (AGVs) are a proven automated transport system for container terminals. Since the introduction in 1993 at ECT in the Port of Rotterdam, AGVs have been used at more than 10 sites across the world. Currently, AGVs are there with the most successful automated transport system in container terminals. AGVs are reliable and can support high Quay Crane (QC) productivity. In addition, battery AGVs have been available since 2012, supporting zero-emission terminals. Overall, AGVs are a solid and proven solution for terminal automation. However, an AGV operation requires significant space on the apron, especially compared to existing terminals with manned vehicles. As terminals are often space constrained, any space that can be saved on the apron directly translates into additional yard capacity. This article describes an alternative approach for the interchange between QC and AGV at a similar footprint as for terminals with manned vehicles.

Figure 1 shows a typical cross-section of a container terminal with perpendicular (to the quay) Automated Stacking Cranes (ASC) and AGVs. Existing AGV terminals have similar apron

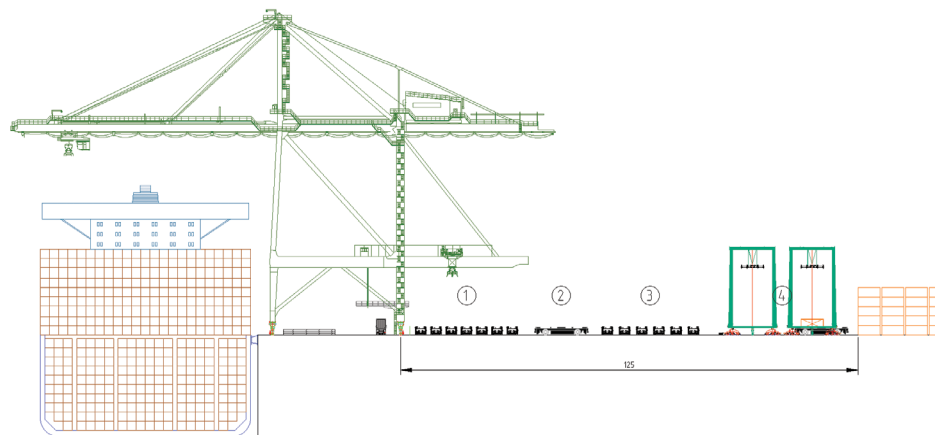


FIGURE 1.
Typical cross section
of AGV terminal with
ASCs

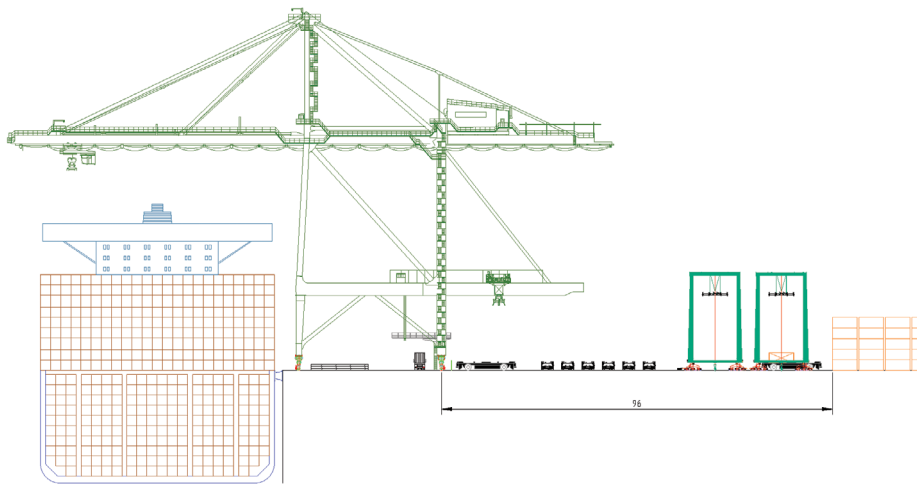
designs, showing an apron width in the range of 120 to 130 metres, measured from the landside QC rail to the first container in the yard. For safety purposes, the AGV operation is typically in the back reach of the QC, separated by a fence from the area where humans are allowed. In addition, most sites use double trolley QCs, i.e. a waterside trolley that moves containers between the vessel and the twistlock platform in the QC and a second landside trolley moving containers between the twistlock platform and AGVs.

The 125 metres wide AGV apron can be split into four areas. From left to right (Figure 1):

1. QC interchange area (7 lanes): for AGV - QC interchange and AGV bypass (to allow for AGVs to access adjacent QCs).
2. Perpendicular buffer: waiting location for AGVs before accessing QC lanes or before entering a highway.
3. AGV highways (6 lanes) for transport along the quay to/from ASC modules in the yard.
4. ASC interchange area: for AGV - ASC interchange.

A significant part (approximately 25 metres) of the 125-metre AGV apron is the perpendicular buffer. This buffer is a key contributor to

“AGVS ARE A SOLID AND PROVEN SOLUTION FOR TERMINAL AUTOMATION. HOWEVER, AN AGV OPERATION REQUIRES SIGNIFICANT SPACE ON THE APRON, ESPECIALLY COMPARED TO EXISTING TERMINALS WITH MANNED VEHICLES.”



an increased QC performance that AGV terminals can support. This buffer allows AGVs to wait close to the QC without blocking other AGV traffic, ensuring smooth traffic on the highways and a timely arrival at the QC, as well as the ability to deal with out-of-sequence arrivals. Simulations have shown that without this buffer, high QC productivities cannot be supported (due to AGVs waiting far away and traffic congestion). This is not only true for AGV terminals, but also for terminals with other types of automated horizontal transport.

To reduce the apron width at AGV terminals, an alternative approach is explored where the perpendicular buffer is not only used as buffer, but also as QC interchange lanes, i.e. eliminating the separate interchange lanes in the original AGV layout, see Figure 2. With this arrangement, the apron width can be reduced to approximately 96 metres. This does

require the QC to have the capability to rotate the container. Therefore, a double trolley QC is required where the secondary trolley (the trolley between twistlock platform and AGV) can rotate the container.

Figure 3 shows the alternative approach next to the "traditional" AGV apron. The difference between the two alternatives can clearly be seen. The reduction in apron width can be directly translated into longer ASC modules with an additional length of about 4 to 5 TEU. Depending on the length of the ASC modules, this could mean an increase of about 10 – 12.5 per cent storage capacity (based on 40 TEU ASC blocks – typical block lengths vary from 30 to 50 TEU).

Another benefit of the narrow AGV apron is the operation in a dense QC cluster. Figure 3 shows a cluster with 5 QCs. In the traditional AGV layout (left), AGVs wait on one side of the cluster and drive to

FIGURE 2.

Proposed cross section of ASC terminal with AGVs

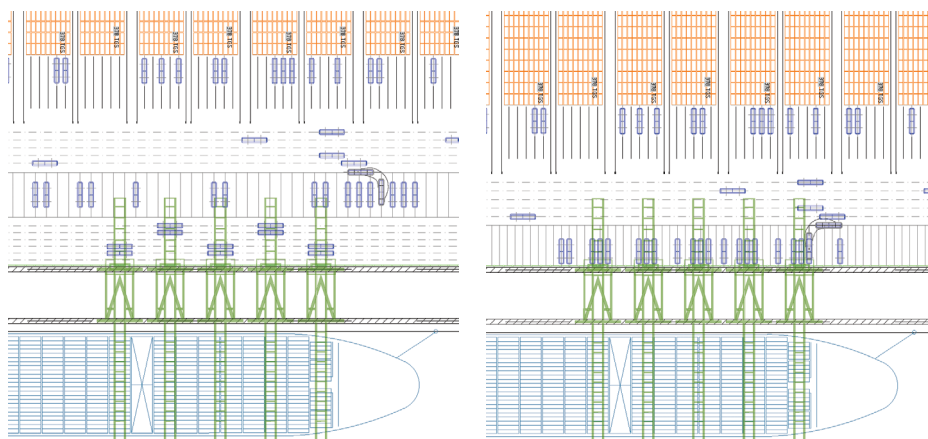


FIGURE 3.

Top view of current AGV layout (l) vs. proposed minimised AGV layout (r)

the crane when needed. To reach the last crane (5th), the AGV must pass four other QCs. This results in dense traffic. In the alternative approach, each QC is directly accessible from the highways, i.e. there is no interference with traffic for the other QCs.

Each QC has access to three dedicated interchange lanes, allowing buffering up to three AGVs per QC. If needed, more AGVs can wait in the vicinity of the QC as there are more lanes available, although without direct access to the QC. When a lane at the QC becomes available, the AGV can drive to the interchange lane.

The grid of buffer/interchange lanes is fixed. Figure 4 shows the arrangement under the QC, for a cluster of three QCs. Each QC always has access to three lanes in the interchange grid. In between two QCs, three to four additional lanes can be used as temporary buffer lanes if all three interchange lanes are fully occupied.

IMPACT ON QC

To enable the proposed narrow apron, containers need to be rotated 90 degrees by the QC. Existing QCs cannot rotate containers. At first glance, this seems a serious obstacle. However, because most AGV sites use double-trolley QCs, the impact of modifying the QCs will not be that big. There is no change needed for the main hoist, i.e. the move between vessel and twistlock platform remains the same as today. The secondary trolley (moving between platform and AGV) needs additional functionality.

In essence, the secondary trolley is nothing more than an overhead bridge crane moving up and down the beams of the crane. To support the narrow AGV apron, two additional functionalities are required:

1. Rotation of the container by 90 degrees.
2. Sideways movement to reach all of the three transfer points dedicated to that quay crane.

“THE MAIN BENEFIT OF THIS CONCEPT IS THE REDUCED APRON WIDTH WHICH PROVIDES MORE SPACE FOR CONTAINER STORAGE (MORE THAN 10 PER CENT).”

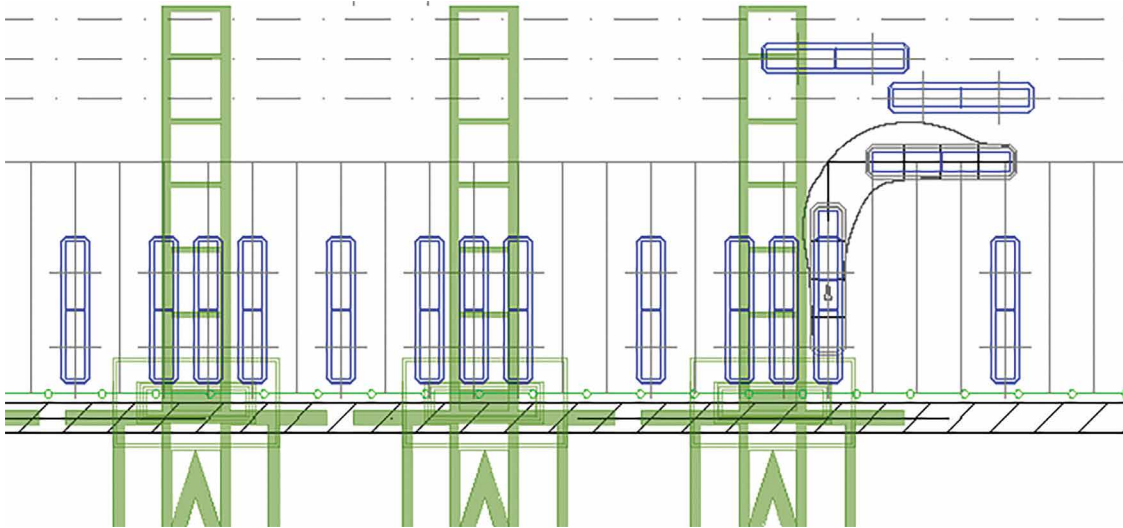


FIGURE 4.
Zoom-in top view
proposed narrow AGV
layout

Both functionalities are available in overhead bridge cranes today, and rotation of containers is common practice in wide-span intermodal (rail head) cranes.

An initial conceptual design of the secondary trolley shows the feasibility of creating sufficient freedom of movement of the secondary trolley to support three interchange lanes at all times. Figure 5 shows a 3D impression of the secondary trolley. The image shows the sideways movement of the trolley, as well as the rotation.

Similar cycles times are expected in terms of performance to the existing double trolley QCs. The sideways movement and rotation can be performed during the travel movement of the second trolley, and in general, the second trolley movements to the AGV interchange lanes are shorter.

The design also has a provision for one exception interchange position. This is a parallel AGV position directly behind the 3 perpendicular interchange positions

(see Figure 6). This position allows for the main trolley, which cannot rotate, to place a container directly onto an AGV. This could be needed in specific cases. For example, certain tank containers cannot be placed on the twistlock platform. It can also be used in case the second trolley is out of service (rather seldom), although that would result in a significant reduction of the crane's performance.

ADDITIONAL BENEFITS

The main benefit of this concept is the reduced apron width which provides more space for container storage (more than 10 per cent). On top of that increase in storage capacity, this alternative approach provides additional benefits:

- Shorter AGV driving distances compared to traditional AGV

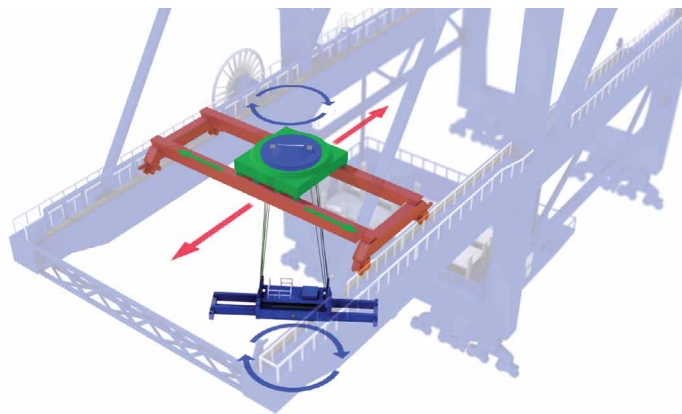


FIGURE 5.
3D impression of
landside trolley with
sideways movement
and rotation



FIGURE 6.
Exception lane for
containers that
cannot be handled
with the second
trolley

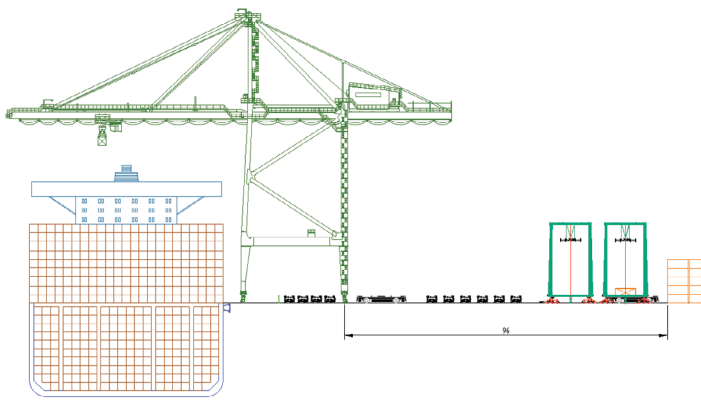


FIGURE 7.
In gauge operation
with single trolley
quay cranes

terminals as the AGVs drive to the interchange lanes locations (with buffer capability) only.

- There is no need to drive through a traffic-dense area around a cluster QCs.
- In the traditional AGV terminal design, AGVs regularly need to make special correction moves to achieve the correct container door direction. This is not needed in the proposed approach, as containers are rotated by the second trolley of the QCs.
- Each QC has its own three interchange lanes, supporting dense QC clusters without a loss of QC performance from AGV traffic congestion.

APPLICATION OF THE CONCEPT

The proposed concept can be used for both greenfield and brownfield applications. All new equipment, including QCs, needs to be acquired for greenfield sites. Depending on the available space, one could choose the traditional arrangement (when space is not an issue), use the proposed arrangement to allow for at least 10 per cent more yard capacity or operate on a smaller footprint. Selecting the appropriate QCs can be part of the design process.

For brownfield sites, the choice is less straightforward. Space-wise, the same considerations apply as the greenfield sites, but - generally -

one can expect space to be limited. Hence, the proposed alternative approach provides benefits. The main challenge is that the existing QCs are often single-trolley QCs that cannot rotate containers. As the existing QCs are often not "end of life", early replacement requires significant CAPEX and is consequently undesirable. Therefore, the arrangement should also work with existing single-trolley QCs.

To support brownfield operation with the new approach, AGV interchange could take place within the gauge of the QC. The interchange lanes are now used as a perpendicular buffer (similar to the traditional AGV layout) for the purpose of waiting, staging, buffering, etc. When the QC is end of life, it can be replaced by a double trolley QC, and operations can be fully moved to back-reach operation (berth by berth) based on the proposed approach.

ABOUT THE AUTHOR:

Jeroen Kats MSc. is Project Director of Design and Simulation Services at Portwise. He supports ports and terminal operators all over the world in their design and improvement process of container terminals. During the last 15 years, he has been involved in a range of projects, including terminal extensions and conversions, redesign of handling systems and the design of (automated) greenfield terminals.

ABOUT THE COMPANY:

Portwise, formerly part of TBA Group, is a world-leading consultancy and simulation firm that combines extensive automation and operational knowledge with proven simulation tools to create a future-proof plan for your port, terminal or warehouse operation.

"THE PROPOSED CONCEPT CAN BE USED FOR BOTH GREENFIELD AND BROWNFIELD APPLICATIONS."

SPEEDING UP THE SUPPLY CHAIN: A GUIDE FOR REAL-TIME TRUCK DATA COLLECTION AND SHARING

A wide-angle photograph of a port terminal at dusk or dawn. Two large yellow gantry cranes dominate the foreground, their long jibs extending over a body of water. The terminal deck is filled with numerous cars parked in rows, and several yellow shipping containers are visible. In the background, a city skyline is visible across the water, featuring various buildings and a prominent church spire. The sky is a mix of blue and orange, with scattered clouds.

"WITH SO MANY DIFFERENT COMPONENTS IN MOTION WITHIN THE SUPPLY CHAIN, REAL-TIME DATA SHARING IS INTEGRAL FOR PORTS TO MAINTAIN BIG-PICTURE VISION WHILE KEEPING AN EYE ON DAY-TO-DAY MOVEMENTS TO IDENTIFY WHERE PROBLEMS ARE OCCURRING."



Lucy Lai,
Director of Product Marketing,
SMATS Traffic Solutions

Increasingly, participants in supply chains are digitizing their operations and looking to new technologies for the future of continuous optimization. With so many different components in motion within the supply chain, real-time data sharing is integral for ports to maintain big-picture vision while keeping an eye on day-to-day movements to identify where problems are occurring. From containers to truck movement, real-time data sharing provides insights that benefit supply chain operations.

PORTS ARE INVESTING IN REAL-TIME DATA SHARING

Ports are looking toward real-time data sharing to improve their efficiency by reducing labor, time, and fuel waste that occurs when delays slow down the supply chain.

One example of real-time data sharing is Port Community Systems (PCS). PCS are open, electronic platforms that allow different organizations and companies to connect their databases and share data with each other. This means that shippers, customs brokers, warehouse managers, government agencies, terminals, and everyone else involved can share their data to keep the supply chain running smoothly and its stakeholders informed.

At a governmental level, data sharing examples include the US government's FLOW initiative. Launched in March 2022, the Freight Logistics Optimization Works (FLOW) is an information-sharing initiative to pilot key freight information exchange between parts of the goods movement supply chain. In April

RIGHT

A cargo truck at a port.



2023, five of California's largest ports [signed a pledge](#) to build a data-sharing system with real-time interoperability with a common goal of supporting improved freight system resilience, goods movement efficiency, emissions reduction, and economic competitiveness.

In addition to Port Community Systems, numerous, nimble real-time data-sharing initiatives have been implemented around the world to improve the efficiency, transparency, and resiliency of the supply chains in anything from vessels, cargoes to landside mobility.

For example, in Canada, the Port of Montréal implemented [Trucking PORTal](#), a smart interface that informs drivers and carriers about traffic volume in real time. Also in Canada, the Port of Trois-Rivières, Québec, collected real-time data to gain visibility into truck turn time and its inside-the-yard movements. The port installed SMATS' [Bluetooth sensors, paired with iNode software](#)

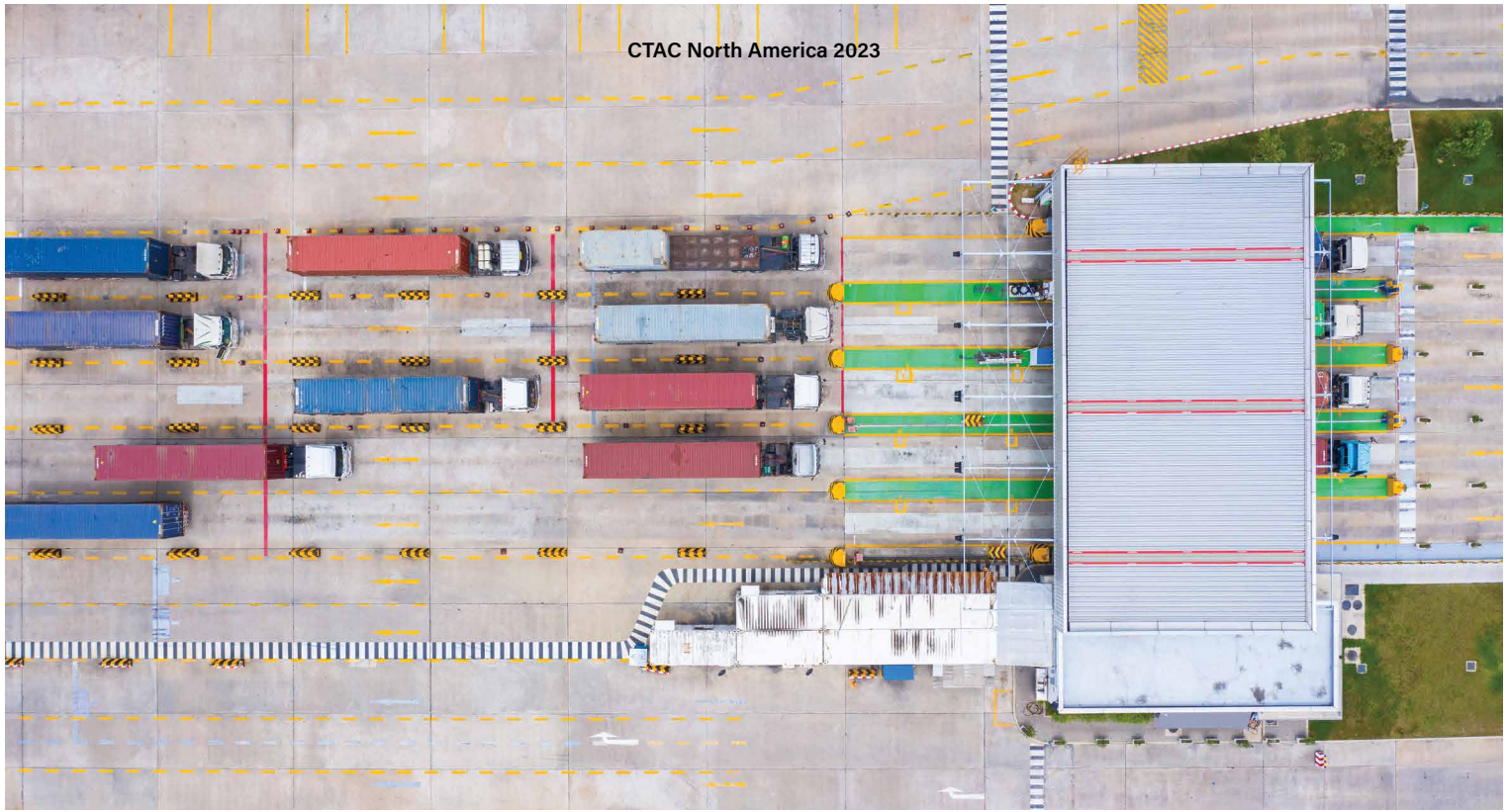
to track truck routes, idle times, and travel times in between stops inside the yard, such as from the port gates to the scales. The project is a cornerstone of the port's data collection and sharing initiatives that will span all aspects of its operations.

COLLECTING TRUCK DATA IS EASIER THAN IT SEEMS.

While many supply chain executives are on board with the importance of data sharing, they recognize that the lack of data access can get in the way.

When it comes to truck data, however, the good news is that collecting data may be easier than it seems.

According to [American Trucking Association](#), trucks move 72.6 per cent of America's freight by weight. Since [99 per cent of overseas trade](#) arrives at ports first in the United States, much of this freight is transported by trucks.



There are four primary technologies for collecting the raw data on truck identification, time, and location within and around ports and terminals. First, by tapping into Bluetooth or Wi-Fi signals emitted by drivers' smart devices or via deployed tags. Second, by tapping into Global Positioning System (GPS) data collected via devices deployed in trucks, such as location apps or fleet trackers. Third, via Automated License Plate Recognition (ALPR) cameras which pair license plate information with truck's time and location data. Finally, by Radio Frequency Identification (RFID) tags and readers which collect truck identification and location information when they are within a certain range. Each of these methods comes with [advantages and disadvantages](#) which port leaders must weigh carefully against

their data sharing objectives and existing technology infrastructure.

TURNING DATA INTO ANALYTICS AND INSIGHTS

The data collection, however, is only the first step towards real-time data sharing. Operation optimization and decision-making require readily usable metrics such as truck wait time, turn time, and movement patterns on existing dashboards or via APIs. Applications, such as SMATS' iNode, leverage their algorithms to turn the raw data into analytics with built-in visualization, reporting, and sharing features. The end goal: timely communications with port stakeholders, and timely adjustments to gate and yard operations to shorten turn time and maximize port throughput.

ABOVE

Trucks waiting to enter a port.

DATA QUALITY IS PARAMOUNT

Quality data is important but assessing quality is not always easy. One of the key indicators of quality data is sample size. Sample size does not need to be 100 per cent to indicate quality data, but it does have to be representative of the reality. Factors that impact sample size, or [data capture rate](#), include weather, visibility, tag adoption rate, signal strength and range, and more. Data collection methods that achieve a high sample size representative of total traffic, such as SMATS' Bluetooth sensors, offer quality data that can be trusted to produce reliable metrics and insights.

Another key attribute to data quality is immediacy. Timely operational adjustments can only be achieved based on real-time or

“REAL-TIME DATA ON TRUCK WAIT TIME, TURN TIME, SPEED, AND ROUTE INFORMATION CAN PROVIDE PORTS WITH THE VISIBILITY THEY NEED TO DESIGN SOLUTIONS FOR LANDSIDE CONGESTION PROBLEMS, MITIGATING TRUCK EMISSIONS AND ENVIRONMENTAL CONSEQUENCES.”



“REDUCING LANDSIDE CONGESTION HELPS MITIGATE UNCERTAINTY FOR STAKEHOLDERS, REDUCES COSTS, KEEPS COMMUNITIES HAPPIER, AND MAKES THE PORT STRONGER AND MORE COMPETITIVE.”

near-real-time data. This data can be hard to get because data sources such as GPS can experience delays for up to several days.

Another factor to consider is compatibility, i.e., is there any application in place that can translate it to your existing systems, such as Port Community Systems (PCS) Terminal Operating Systems (TOS), Truck Appointment Systems (TAS), Automatic Identification Systems (AIS), and Variable Message Signs (VMS). Applications such as SMATS' iNode are agnostic of data sources and can be linked to any of the systems above via API.

BUILDING GREENER PORTS

Trucks idling in long queues at entry gates or inside the port release greenhouse gas emissions that result in environmental harm and air pollution. A [report by UCLA](#) shows that diesel truck exhaust from some of the California ports contributes significantly to worsening air quality, affecting not only the port but the surrounding communities. The [United States Environmental Protection Agency](#) notes that trucks coming and going from ports can have a significant impact on air and noise pollution in nearby communities and that reducing idle time and having

ABOVE
The Port of Trois-Rivières.

designated truck routes that avoid residential communities can significantly reduce emissions and air pollution concerns. Real-time data on truck wait time, turn time, speed, and route information can provide ports with the visibility they need to design solutions for landside congestion problems, mitigating truck emissions and environmental consequences.

SPEEDING UP THE SUPPLY CHAIN

As ports become more digital, there is a need for real-time data to allow for proactive assessment and decision-making. According to a [research study in the Maritime Transport Research journal](#), landside congestion can have negative effects on the supply chain by creating delays, creating uncertainty for logistics service providers, raising costs for the supply chain as a whole, and making ports less competitive in the long run. While solving landside congestion is only one part of what makes a port competitive, it plays a critical role in the supply chain. Reducing landside congestion helps mitigate uncertainty for stakeholders, reduces costs, keeps communities happier, and makes the port stronger and more competitive.

Real-time data can help your port and terminals reduce landside congestion and offer critical insight into how trucks are moving through your port. Real-time data provides valuable metrics, reduces air pollution and greenhouse gas emissions, and improves operations and the competitiveness of your port.

ABOUT THE AUTHOR:

Lucy Lai is the Director of Product Marketing at SMATS Traffic Solutions. She leads SMATS product direction and marketing strategy development. Lucy is committed to promoting smart transportation technologies to help address supply chain challenges such as port congestion, pollution, and digital transformation.

ABOUT THE COMPANY:

SMATS specializes in smart transportation data collection and analysis. Our technology includes next-generation Internet of Things (IoT) sensors and iNode, an AI-powered big data analytics platform. SMATS' port traffic management solution has enabled ports and terminals around the world to collect real-time landside mobility data and make data-informed decisions.



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CHARTING A COURSE TO A **RESILIENT** **TOMORROW** Pioneering Integrated Port Design



A DIGITALIZATION JOURNEY FOR COMPLEX PROBLEM SOLVING IN DYNAMIC ENVIRONMENTS TO ACHIEVE ILL-DEFINED GOALS



Ángel Martínez, Head of Products Terminal Solutions, Prodevelop,
Francisco Blanquer, R&D Senior Manager, CMA CGM and Chair
 Operations Council, Terminal Industry Committee 4.0, **Ben Othman**
Nasser, R&D Digitalization for Terminals, CMA CGM

It is not only about power. It is time, it is speed. This is one of the most famous movie quotes of Creed III, the third installment (2023) in the Creed sequence of films, and the ninth overall in the most iconic American boxing movies: the Rocky Balboa's Saga. The film sees the recently-retired boxer Adonis Creed coming face-to-face with Damian Anderson, who was his childhood best friend and a former professional boxer with a distinct aggressive fighting style. Although our protagonists always must face a supervillain through the whole epic of fights, they have characteristics, skills, and peculiarities that make them distinct: sometimes they possess a brutal strength, while others have a huge determination, a dark past, or a personal grudge among them. In essence, this remains constant yet perpetually evolves, embodying a distinctiveness akin to the operations of container terminals spread across the globe.

Container terminals are living ecosystems built over complex and large infrastructures with several parties interacting in a coordinated way to offer highly complex logistic services under strict operational planning and tight cost controls. Due to the port and shipping

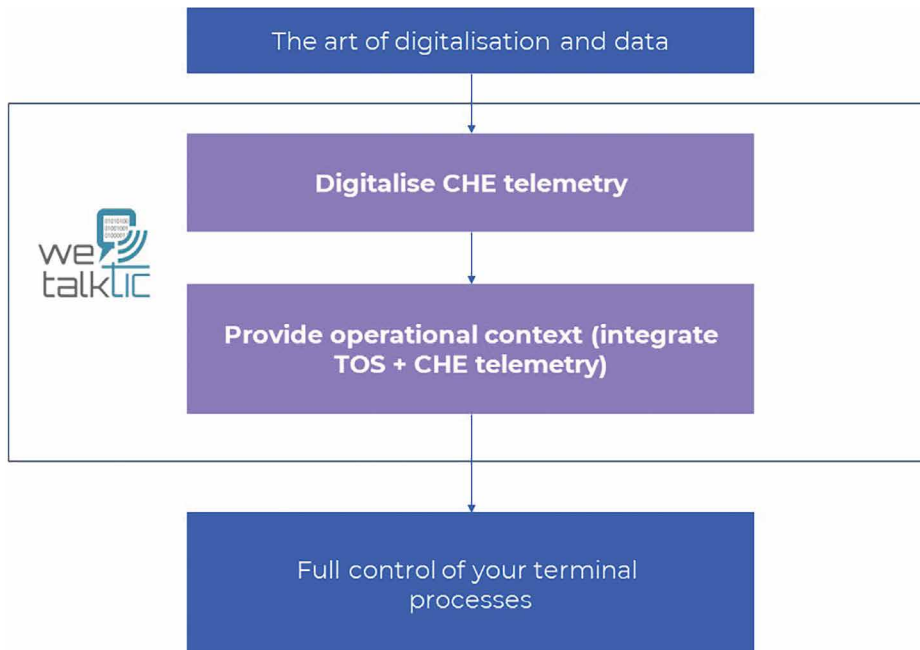
industry's competitiveness, challenging requirements, and demanding needs, operations within a container terminal must be accurately carried out to achieve high operational efficiency, while also ensuring safety, sustainability, reliability, and profitability. Port efficiency is typically characterized by maximizing terminal cargo operations productivity rates and minimizing idle time for both Container Handling Equipment and the staff involved during the end-to-end port call processes. Much has been said about the resilience, flexibility, and adaptability of global supply chains. Therefore, one of the highest priorities of logistics global groups is not only to try to improve their local needs continuously but also to standardize their operational processes and working conditions no matter the container terminal's location and core business (i.e., containers, liquid bulk, dry, etc.). CMA CGM, a leading company for the last 40 years in shipping and logistics solutions spanning the globe, is a good example of an entity that is consistently looking for innovative solutions for implementing its digitalization strategy through its two port operators, TERMINAL LINK and CMA TERMINALS.

Combined, they manage more than 50 terminals around the world, applying and endlessly developing their expertise to provide the safest, most efficient, and most sustainable cargo handling service possible.

EFFICIENCY OVER POWER, BABY!

Every container terminal has its pain points to overcome or challenges to meet but they generally share common goals which are to optimize operations, maximize revenue, and achieve long-term sustainability. Expansion or investment in new equipment can help towards these goals but other initiatives, such as standardization of business processes, can go a long way to achieving such objectives, and with a shorter lead time. Digitalization allows terminals to establish standardized practices, facilitating swift transformation of their operations; simultaneously, it fosters a shared comprehension with their clientele. This helps to shape a more efficient, resilient, and greener maritime supply chain. For that reason, terminal operators and innovation managers should look to measure real-time operational data from multiple sources of information, in particular CHE telemetry and Terminal

"EXPANSION OR INVESTMENT IN NEW EQUIPMENT CAN HELP TOWARDS THESE GOALS BUT OTHER INITIATIVES, SUCH AS STANDARDIZATION OF BUSINESS PROCESSES, CAN GO A LONG WAY TO ACHIEVING SUCH OBJECTIVES, AND WITH A SHORTER LEAD TIME."



Operating Systems' data (i.e., TOS). Everything from troubleshooting to long-term capital investment decisions is currently based on poor-quality data at best, and perception at worst, but tools are available to change this. Thanks to connecting equipment and systems in real time, shift leaders can rely on objective information using live heatmaps and alerts to identify bottlenecks and congestion in the yard and take the appropriate corrective actions, whilst management can use Key Performance Indicators (KPI) dashboards to assist in continuous improvement and investment programs. Besides that, digitalization requires as a first step, the need to agree on standards, terminology,

and vocabulary as a mandatory prerequisite to be able to tell a story with context enough as a baseline on which to build something solid. In other words, a business process could not be improved or optimized if an agreement between all the different stakeholders (crane manufacturers, PLC suppliers, TOS vendors, etc.) is not reached first. Promoting a mutual understanding and data sharing among all stakeholders is the only way to achieve operational efficiency. This enhances coordination, contributes to decarbonizing the supply chain, identifies potential issues in advance, reduces inefficiencies, and promotes resource reuse, eliminating the need to always start from scratch.

DO NOT RUN BEFORE YOU CAN WALK

CMA CGM in collaboration with its technological partner Prodevelop has started deploying Posidonia Terminal 4.0, an IoT, Edge Computing & Big Data platform that combines RAW data gathered in real time from the different CHE available in the yard with TOS information into a digital core foundation that precisely provides full context of the terminal's operations. One of the strengths of Posidonia Terminal 4.0 is that it is the only Big Data platform fully compliant in the market with the latest TIC4.0 version of the standard. TIC4.0 is the first process and telemetry language understandable by any type of supplier, equipment manufacturer, or computer service provider to allow seamless transmission of the information generated during terminal container handling logistics. Given the large number of different vendors, manufacturers, industrial communication protocols, and IT service providers co-existing in the same environment, interoperability is key for a fast and reliable deployment. This interoperability is granted by the TIC4.0 language and its associated data model, easing the deployment and shortening the time to go live (i.e., weeks not months). The deliverables, recommendations, and outcomes from the TIC4.0 Organization are not an option in a global industry but are mandatory to ensure the acceptance and understanding of high volumes of diverse data coming from distributed and heterogeneous sources of information.

“TIC4.0 IS THE FIRST PROCESS AND TELEMETRY LANGUAGE UNDERSTANDABLE BY ANY TYPE OF SUPPLIER, EQUIPMENT MANUFACTURER, OR COMPUTER SERVICE PROVIDER TO ALLOW SEAMLESS TRANSMISSION OF THE INFORMATION GENERATED DURING TERMINAL CONTAINER HANDLING LOGISTICS.”

A digitalisation journey for Complex Problem Solving in dynamic environments



CMA CGM's digitalization journey started eight years ago deploying IoT Gateways in the whole fleet of assets available in its container terminal located in Malta (i.e., Malta Freeport terminal, MFT). Today, the plan is already live with the setup of Posidonia Terminal 4.0 in five additional container terminals of the group (i.e., Fenix Marine Services, Total Terminal International Algeciras, Terminal des Flandres, Port of Thessaloniki, and CMA Beirut Terminal). The target goal, to be achieved by the end of 2023, is to be able to gather data in real time and merge it with the information that comes from the TOS so that managers can start analyzing data and understand the actual status of its container terminal. From this point onwards, the different responsible of the terminal will be able to optimize the different steps of the operation (thanks to the understanding of the present and past carried out), and start taking advantage of the analysis of trends which will enable them to forecast the reality and predict the near future (i.e., if – then scenarios to be proactive, rather than reactive) thanks to Machine Learning or Artificial Intelligence models. Unfortunately, there are no shortcuts in life, magic solutions, or silver bullets to improve the operational efficiency in a container

terminal. The first mandatory step is to be aware of the actual status of the terminal by measuring in real time the accuracy and performance of the most important business process (i.e., job stepping). The main element of this enterprise is the availability of an open IoT gateway, where the data collected from the PLC is translated to TIC4.0 format and published to a Big Data platform.

Container Handling Equipment is heavy machinery that has several subsystems running in real time inside, all of them managed by controllers (such as PLCs, CAN bus controllers, etc.) and provided, deployed, and maintained by different vendors and manufacturers around the world. These systems take the input directly from the machine or subsystem via sensors, transducers, or encoders, and execute the logic programmed in its internal memory. Finally, it generates useful outputs on actuators to physically control and enable the staff to manipulate the crane. Nowadays, the use of PLCs is prevailing in industrial automation over other possible solutions such as the use of computers (even industrial ones) due to the extreme requirements of these environments. PLCs are, therefore, the place where the most frequently updated data is present, and, as the measurement

of this information is directly carried out from the sensors, it is also the most realistic, accurate, and reliable representation of the actual status of the machine. The gathered and processed data is then forwarded to a message broker which persists the information in a well-known format into a Data Lake. That information is easy to exploit and manage to provide insights into levers of action which will optimize actual operation.

EXPERIENCE TELLS US: PRACTICE MAKES THE DIFFERENCE

At its genesis, nothing about an eventual innovation is new. To get started, all you need is a hunch about a real-world problem that matters; a set of parts and access to a community of people to render the problem tangible; a strategy to engage in trial and error; and an appetite to learn by being productively wrong. You learn about the problem as you bring together those people and parts. The pathway is full of choices and the potential outcomes are endless. CMA CGM, through its digitalization journey, is the engine that nurtures the conditions for innovating from a pragmatical point of view that yields impact and prepares it to produce new products, services, and even companies, while

“BY CONNECTING EQUIPMENT AND SYSTEMS IN REAL TIME, CONTAINER TERMINALS CAN LEVERAGE THE ALMOST UNLIMITED NEW COMPUTATIONAL POWER AVAILABLE TO ANALYZE BIG DATA, LEADING TO IMPROVED DECISION-MAKING, MORE AUTOMATED PROCESSES, INCREASED UTILIZATION OF CURRENT INFRASTRUCTURE, AND HIGHER OPERATING MARGINS.”

developing industrial innovations as well as fulfill both scientific and commercial goals. Such outcomes, in combination with the TIC4.0 standard, are paving the way for establishing a FAIR (i.e., findable, accessible, interoperable, and reusable) and decentralized baseline; this will in turn transform the way container terminals work and adapt quickly to the challenges, whether they relate to reducing idle time, increasing safety, or making the business more sustainable. By connecting equipment and systems in real time, container terminals can leverage the almost unlimited new computational power available to analyze Big Data, leading to improved decision-making, more automated processes, increased utilization of current infrastructure, and higher operating margins. Additionally, as more terminal operators and maritime terminal industry suppliers commit to TIC 4.0 message standardization, we will see increasing adoption across the sector simplifying communication between parties, enhancing interconnectivity, removing errors, and saving the time to go live. In conclusion, improving the efficiency of container terminal is not only about power, but time and speed too – as our famous boxer said.

ABOUT THE AUTHORS:

Ángel Martínez is a Telecom Engineer, PhD student, and Head of Products, Terminal Solutions for Prodevelop where he has the opportunity to validate new business models as well as to build solid and innovative technological ICT solutions to improve performance, user experience, and RoI of industrial partners.

Francisco Blanquer, R&D Senior Manager at CMA CGM and Chair Operations Council of the Terminal Industry Committee 4.0, is a Spanish Civil Engineer who has developed functions of innovation and development engineer in the port sector managing greenfield projects, introducing technologies, and disseminating the digital culture in their terminals. During the last six years, he has developed IoT, Big Data, Edge Computing, and decarbonization projects for CMA CGM, supporting the group's container terminals.

Ben Othman Nasser, R&D Digitalization for Terminals at CMA CGM, is a French Engineer who has worked for 11 years in the port industry managing projects related to maintenance and operation, and has introduced optimization and process efficiency culture in terminals. Since 2022, he has been working within CMA CGM to deploy Big Data & IoT for its terminal portfolio.

ABOUT THE COMPANIES:

Prodevelop is a highly specialized ICT company with a growing product portfolio to digitalize and optimize the maritime industry. Prodevelop prides itself on its ability to offer customized, flexible, and innovative solutions that are designed to meet the specific requirements of port authorities and terminals.

Present in over 160 countries through more than 400 offices, 750 warehouses, and 155,000 staff members, equipped with a modern fleet with 600 vessels, CMA CGM serves 420 of the world's 521 commercial ports and operates on more than 257 shipping lines.



The Terminal Industry Committee 4.0 (TIC4.0) initiative aims to bring together representative companies from both the Terminal Operators industry and Port Equipment Manufacturers and Suppliers to collectively work on the elaboration of standards. The TIC4.0 initiative has been endorsed by the Federation of European Private Port Companies and Terminals (FEPORT) and the Port Equipment Manufacturers Association (PEMA).

AI REVOLUTION IN SUPPLY CHAIN OPERATIONS

"DATA CAN BE CONSIDERED THE 'FUEL' FOR AI AND ML SYSTEMS, AND ITS QUALITY AND QUANTITY ARE KEY TO THE SUCCESSFUL DEVELOPMENT AND DEPLOYMENT OF THESE SYSTEMS."



Sawyer Smith,
Product Manager, FourKites

Artificial Intelligence (AI) has received a lot of buzz for its potential to be a transformative force, offering unprecedented opportunities for optimization and innovation. As AI progresses from hype to reality, it's important to understand the nuances of its capabilities, its distinction from other technologies, and its potential future applications.

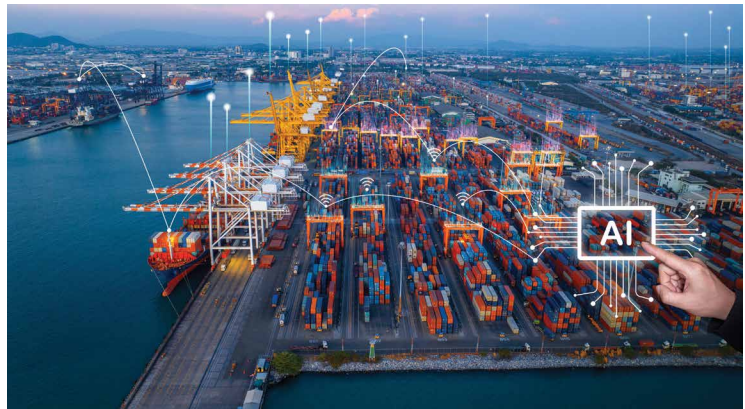
In this Q&A with FourKites' **Sawyer Smith**, a Product Manager focusing on data science and AI, we explore the advancements developed by FourKites and others, shedding light on the practical applications and the immense value they bring to shippers and carriers.

What AI capabilities are FourKites and others developing for supply chains? How are shippers and carriers using them?

FourKites leverages AI to provide dynamic estimated times of arrival (ETAs), recommended routes and appointment times, and the potential financial and operational impacts of supply chain disruptions.

Our new natural language assistant, Fin (FourKites Intelligence Network) AI, can help customers:

- Quickly diagnose why a shipment isn't tracking and bring it online to increase visibility throughout their network.
- Survey the impact of disruptive events on customers' supply chains so they can spend less time tracking down information and more time implementing a recovery plan.



- Obtain product guidance across the entire FourKites product suite and distill the most relevant insights into just a few sentences.

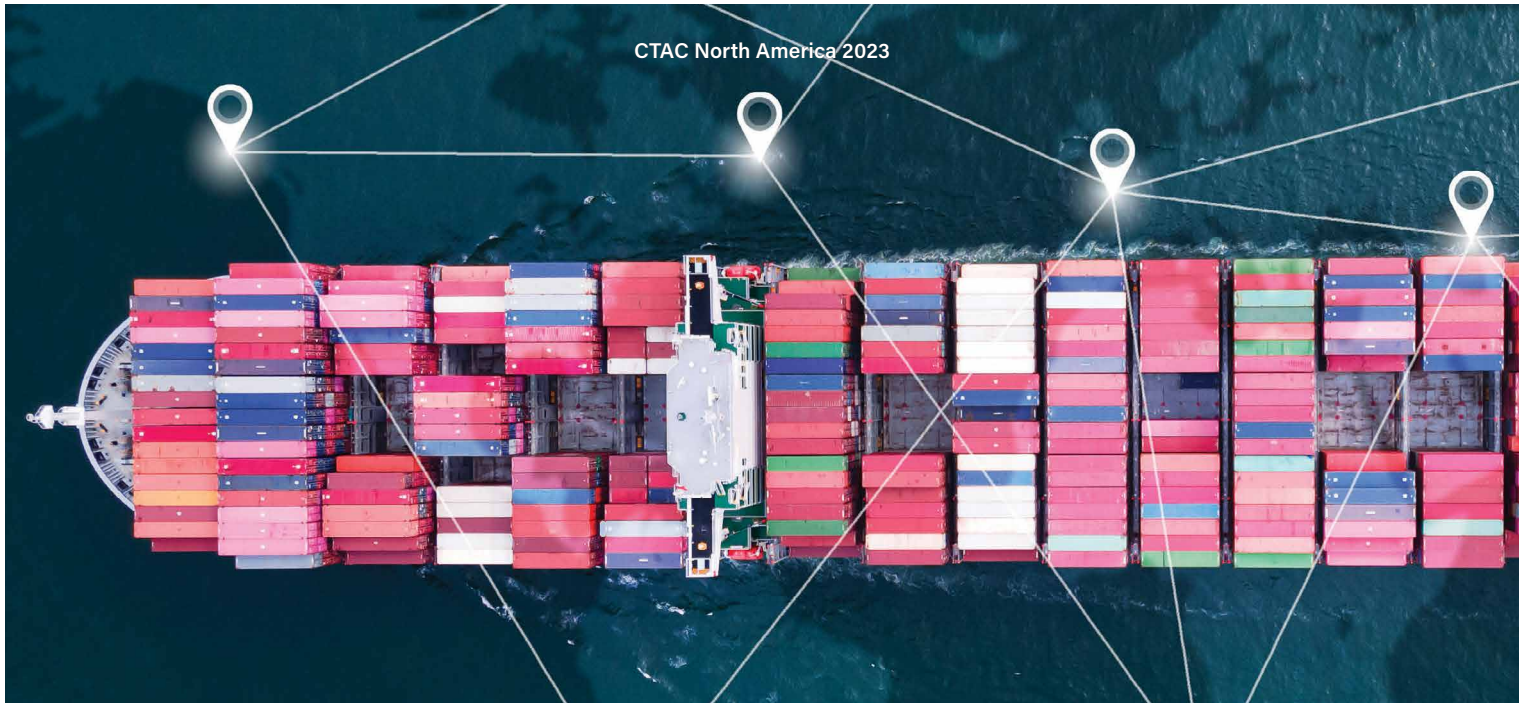
Fin AI became available in October 2023, with additional features and capabilities coming soon.

How is AI different from machine learning and other technologies? What is required to build AI functionality?

AI is a broad field of computer science – including things like machine learning, neural networks, expert systems, robotics, and natural language processing – that aims to create systems that can perform tasks that would typically require human intelligence. Machine learning is one of the most common forms of AI that uses statistical techniques to identify patterns in data, with the ability to make decisions or take actions based on it. Since supply chains deal with tangible goods, other technologies like IoT devices and robotics often incorporate AI and ML.

Data can be considered the "fuel" for AI and ML systems, and its quality and quantity are key to the successful development and deployment of these systems because they are only as good as the training data. If the data contains inaccuracies, inconsistencies, or incompleteness, then a model's predictions or classifications can have flaws. Meanwhile, larger datasets often allow models to recognize a wider variety of patterns, leading to better outcomes with new, unseen data. This is especially important in complex tasks where nuances and edge cases matter, like supply chain. Therefore, the companies that maintain unique, large datasets can provide the most value with solutions trained on data beyond what is available from the open internet.

FourKites' large and diverse network of high-quality supply chain data – tracking more than 3 million shipments for more than 1,200 of the world's most recognized brands and encompassing more than 6,000



“DATA IS THE BACKBONE OF ANY AI INITIATIVE, SO ENSURE THAT YOU HAVE ACCESS TO HIGH-QUALITY, RELEVANT DATA OR ARE USING A PROVIDER WHO DOES.”

data points per shipment and over 18 million ETAs per day – enables us to develop highly advanced and accurate AI and ML systems.

What else might AI be able to do for supply chain leaders?

AI has the opportunity to vastly improve how companies manage their suppliers, inventory, and demand forecasting while making sourcing and operations more efficient. The possible applications will grow as other technologies mature. For example, advancements in image recognition and computer vision can allow for real-time product inspections, ensuring that only top-quality items progress in the supply chain. AI could also monitor supply chain transactions, detecting anomalies and safeguarding against potential fraud or theft, thereby adding a layer of security to operations and advanced exception monitoring and resolution.

What advice would you give to other companies looking to integrate AI into their supply chain operations?

The industry is still in the early stages of this AI revolution. It's our goal to help companies continue to evolve with technology and discover both predictive and personalized insights with the help of AI. Those that integrate AI into their supply chain operations will continually unlock new efficiencies and opportunities to scale.

However, it's essential to approach the adoption of AI with a clear objective in mind. Understand what you aim to achieve, be it improved forecasting, optimizations, or elevated customer service. Data is the backbone of any AI initiative, so ensure that you have access to high-quality, relevant data or are using a provider who does. It's equally crucial to have a skilled team in place, comprising data scientists, domain experts, and IT professionals, to drive adoption and implementation. As with any new technology, there will be challenges. Be prepared for a learning curve. Remain open to iterating and refining your approach based on feedback and results.

ABOUT THE AUTHOR:

Sawyer manages strategy and product development related to Artificial Intelligence recommendation products within the Data Science team at FourKites. Before joining FourKites, Sawyer served as a private equity analyst for a fund specializing in investments within the food, pharmaceutical and cold chain infrastructure sectors. He studied Industrial Engineering and Economics at Northwestern University.

ABOUT THE COMPANY:

Supply chain visibility platform FourKites extends visibility beyond transportation into yards, warehouses, stores and beyond. Tracking over 3 million shipments daily across road, rail, ocean, air, parcel and last mile, and reaching more than 200 countries and territories, FourKites combines real-time data and machine learning to help companies digitize their end-to-end supply chains. Over 1,200 top global brands trust FourKites to create more agile, efficient and sustainable supply chains.

www.fourkites.com

REAL-TIME DATA SHARING IN SUPPLY CHAINS: OPPORTUNITIES AND CHALLENGES

88%

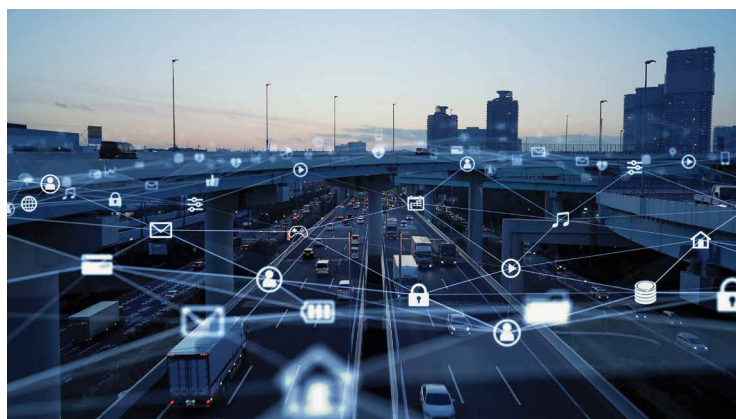




Wolfgang Lehmacher, Supply Chain and Technology Strategist, with **Mikael Lind**, Senior Strategic Research Advisor, RISE, and (Adjunct) Professor in Maritime Informatics, Chalmers

The sooner data is at hand, the earlier we can act. Big data analytics and Artificial Intelligence (AI) can improve supply chain and logistics management. Analytics is about what is, what may be, and what are options if we wish to influence the course of things building on operational and ecosystem data. Analytics and data sit at the core of digitalization.

In a world of real-time data sharing and AI, supply chain professionals are empowered to make (joint) evidence-based decisions to respond to deviations from plan and crisis situations. This can improve efficiency, quality, safety, and ethics of an area of concern, e.g., a global supply chain operation. Real-time data and descriptive analytics enable close monitoring of equipment, stock levels, and cargo movements, but also of the state and conditions of the supply chain ecosystem, including roads, ports, and oceans. Predictive analytics provide alerts on possible future events to allow for preemptive maintenance of equipment or mitigative operational actions before problems arise. Prescriptive analytics suggest options for solving problems. Data sharing leads to higher visibility, efficiencies, precision in the management of processes, resources, and infrastructure, and improved safety and ethics. Data sharing tools are bridging distances and help create a climate of trust across companies and along supply chains fostering collaboration as a prerequisite of digitalization. Real-time data is what powers automation: autonomous vehicles, vessels, and any kind of processes. Robotic process automation (RPA)



“IN A WORLD OF REAL-TIME DATA SHARING AND AI, SUPPLY CHAIN PROFESSIONALS ARE EMPOWERED TO MAKE (JOINT) EVIDENCE-BASED DECISIONS TO RESPOND TO DEVIATIONS FROM PLAN AND CRISIS SITUATIONS.”

solutions have already found their place in companies' front and back offices.

Despite the progress, 69 per cent of digital transformation projects fail according to McKinsey. The reasons are hardly technical but mostly managerial and we believe often cultural. In this contribution, we provide an overview of the data sharing landscape also alluding on the importance of ensuring a conducive culture for true digitalization, which includes digital integration and data sharing.

1. PREREQUISITES FOR DATA SHARING

Technologically, the Internet of Things (IoT) and AI play a fundamental role in the digitalization of supply chains. Thanks to increasingly affordable devices and software, connected supply chains are now feasible. Supply chain professionals can monitor end-to-end (e2e) supply chains and the e2e life cycle of a product. 5G, smart sensors, and Digital Twins brought in a new

“THE INDUSTRY SHOULD NOT ONLY WORK TOWARDS OPERATIONAL BUT ALSO CULTURAL ALIGNMENT IN AREAS OF COMMON INTEREST.”

dynamic: data is directly collected from infrastructure like cranes, trains, trucks, ships, and bridges and analyzed using algorithms producing results visualized on 3D interfaces. Interoperability between systems of different actors in supply chain networks, including shipping lines, brokers, freight forwarders, cargo owners, and customs authorities is critical for data sharing. AI helps to overcome the challenge of incompatible data formats as well as filling potential gaps in the data flows by deriving probabilities from historical data providing parts to the full picture.

Managerially, trust and culture are critical. But all this requires that partners establish sufficient trust to exchange information throughout the value chain. Progress in digitalization in supply chains and logistics is not a matter of technology but of trust and culture. Trust is easier achieved in a simplified world where rules are concise and incentives clear. In a data sharing environment, this also includes trust in partners' ability to ensure cybersecurity and compliance with regulations, like the European Union GDPR, US CCPA, and cybersecurity compliance requirements by the Federal Trade Commission. Fortified cybersecurity measures like secure databases, data encryption, and cybersecurity audits are warrants of trust. Trust also requires that fears of job losses need to be addressed. Culture is what drives or deprives change. Digitalization and data sharing require a conducive culture. And more than that. It requires leaders that engage and mobilize entire companies and ecosystems. The movement starts with the search for common areas of interest, answering the 'why' question, why should we digitalize

and share data? The 'why' - ideally packed in a few words and lived across the company - guides the what and how. In a digital world and self-organized supply chains, collaboration is a critical cultural component. The industry should not only work towards operational but also cultural alignment in areas of common interest.

Overall, today's winners are digital and collaborative. Digitalization and collaboration operate symbiotically. Digitalization promotes collaboration through swift and efficient digital information exchange enabling effective coordination. Simultaneously, digitalization requires collaboration. We even claim that [without collaboration there will be no large-scale digitalization, and without digitalization there will be no large-scale collaboration](#).

2. SELECTED DATA SHARING USE CASES

Data supports planning, like demand forecasting, optimization of inventory levels, and streamlining of logistics processes. The sooner one gets data, the sooner one can plan, and the easier is replanning in case of deviation from the plan. Real-time monitoring of vehicles and cargo allow for improved operations, e.g., through corrective action and continuous optimization.

Tomorrow's transport systems require actors to collaboratively respond to partners' concerns. We selected some use cases to illustrate the power of collaboration, digitalization, and data sharing in supply chain networks.

Cargo visibility

Visibility or better data is foundational. Data is the oil of the

digital systems. Data allows for analytics to work. The more data the better algorithms are trained, the better the results. Visibility can be established on the level of a vehicle, e.g., a truck or a ship, a loading unit, e.g., a pallet or container, and a piece, e.g., a product or part.

In 2002, large ships began fitting automatic identification system (AIS). AIS transmits dynamic information relating to a ship's course, speed, and heading; static information related to the ship's name, length, and breadth as well as voyage-related details such as cargo information and navigational status, e.g., underway or at anchor. The combination of these information pieces helps situational awareness and collision avoidance.

Maersk was an internet-of-things (IoT) pioneer. In the early 2010s, the shipping line started to install IoT devices on nearly 300,000 reefer containers. Since mid-2015 Maersk has monitored the company's reefers constantly. The devices allow for real-time detection of reefer malfunction, compared to traditional 12/24 hours through physical inspection. Hapag-Lloyd introduced real-time monitoring for its reefer container fleet in 2019 and started in 2022 to install IoT devices on all standard containers of its three million TEU fleet adopting the principles of the smart container. Real-time data from each container make the supply chain more transparent and shipping safer. The IoT devices supply location data based on GPS, measure temperature, and monitor shocks to the container. Additional sensors with different functionalities can be added.

Some containers contain products with sensors establishing visibility on the piece/item level. All sensors gather and share predefined information, like location, temperature, humidity, and shock



in configured cadences of minutes, hours, etc. The further we advance in our development the denser will be the maze of data companies, organizations, and governments can access and leverage.

Ship operations

Real-time sea state observations, like currents, waves, and swell ship operators can route according to ocean and weather conditions optimizing fuel burn and greenhouse gas (GHG) emissions, supporting the [2023 International Maritime Organization \(IMO\) GHG strategy](#).

Electronic documents

Examples of document digitization in supply chains are Bills of Lading (BL), Statements of Fact, and a diverse range of certificates. Regulatory acceptance and industry-wide adoption will allow the shipping sector to advance towards automation enabling further optimization of processes and transactions.

However traditional electronic documents are not reliable for data-driven applications. Information such as shipper and consignee details, origins, and destinations are replicated across multiple documents. This redundancy leads to inefficiencies and risk of error. [The true transition pivots from document-based data exchange to a data-centric model](#), like the one applied by IATA's ONE Record.

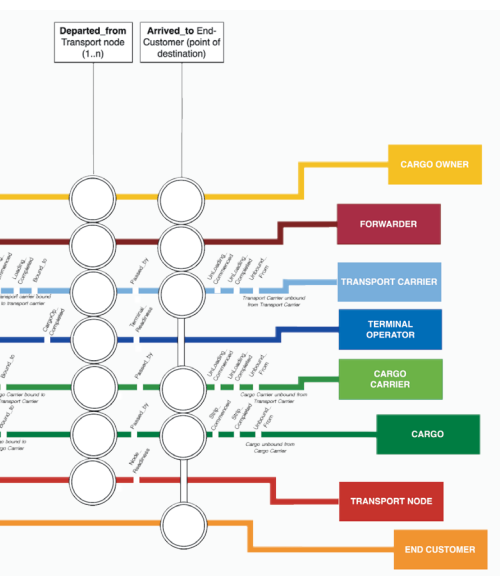
3. MANAGING THE CULTURAL SHIFT

Behavior change in the economy is regularly triggered by monetary incentives, like cost advantages, subsidies, and revenue opportunities, but also by new obligations. The introduction of AIS is a good example of such an obligation when the maritime sector underwent a major change when the sharing of position, speed, and heading became legally mandatory as a safety requirement. This change resulted

in higher safety standards but also a new market for digital services leveraging AIS data well beyond the scope of its original intentions.

Regulation and sufficiently funded governmental programs can help to focus resources on digitalization and collaboration. This supports academia in their respective basic research, research institutes in their applied research, and businesses in their research and development. Collaboration should be understood as a focus on common areas of interest, e.g., [decarbonization](#) and circular economy. Pressure on common pain points drives digitalization and collaboration. The obligation to report on Scope 3 emissions may become the catalyst for a new era of large-scale data sharing across supply chain networks. Decarbonization might turn into a much bigger market opportunity for data services for supply chain networks than what AIS has become for maritime transport.

“TODAY’S WINNERS ARE DIGITAL AND COLLABORATIVE. DIGITALIZATION AND COLLABORATION OPERATE SYMBIOTICALLY.”



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Contact the authors of this article to join us in our efforts to drive improvements and positive global change, in supply chain management.

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Mikael Lind is the world's first (adjunct) Professor of Maritime Informatics engaged at Chalmers and Research Institutes of Sweden (RISE). He is an expert contributor at World Economic Forum, Europe's Digital Transport Logistic Forum (DTLF), and UN/CEFACT. He is co-editor of the first two books on Maritime Informatics, co-author of the Practical Playbook for Maritime Decarbonisation, and co-editor of the Maritime Decarbonization book.

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The concept of co-competition sits at the core of the VWTnet. While competing on sales and sourcing markets, VWT members co-create for collective use a common tool to augment each member's and the community's ability to deal with economic constraints and societal challenges like supply chain disruptions and GHG emissions respectively.

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