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Welcome to our Smart Digital Ports of the Future 2022 edition of the Port Technology International Journal!

This is the first in-person international event produced by Port Technology International prior to the pandemic: and it is a pleasure to welcome so many industry leaders to Rotterdam, one of Europe's premier container hubs, for the two-day event answering many of the sector's challenges through digitalisation, optimisation, and forward-thinking philosophies from ports and logistics chains.

With that said, we would be doing our readership a disservice if we did not match our high-quality agenda with a similar set of content submissions for this Port Technology 120 Journal edition.

We are delighted to welcome a pair of submissions from the International Port Community Systems Association (IPCSA) on its latest progressions. From its Network of Trusted Networks with ports across Morocco, to collaboration with the Port of Antwerp on drone usage, Port Community Systems are becoming more agile and connected to provide efficiencies in the supply chain.

In the Northeast of the United Kingdom, the Port of Tyne is harnessing data to better understand its operational processes. The newly-launched digital platform as part of the Clean Tyne project, providing real-time information on the port's energy use to help the facility reduce its carbon emissions.

We welcome a submission from Commissioner Carl W. Bentzel, of the Federal Maritime Commission (FMC) on digitising inland supply chains in the US to improve operational efficiencies. Throughout the pandemic we have seen bottlenecks not just at maritime hubs, but inland networks also. Commissioner Bentzel gives the latest on his work with logistics stakeholders to improve the sector’s output in the years ahead.

At the coalface of those cargo flows is the Port of Los Angeles. The Western Hemisphere’s largest port, the Port of LA has expanded its Port Optimizer platform to all container terminals in its facility. Users can now benefit from a swathe of new features; including current containerised import volumes, projected container arrivals and current vessels at anchorage.

Jack Donnelly, Editor
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Journey Towards a Sustainable Future

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Founded by Dr Rafiq Swash, Aidrivers is powered by a team of seasoned and passionate professionals and scientists who work together to deliver autonomous mobility automation for demanding industrial applications.

Aidrivers’ autonomous ecosystem is designed for industrial mobility automation that provides autonomous navigation (AIOS) capability for heavy industrial vehicles in complex port environments – with empowering systems that include V2X-enabled Fleet Operator (AIFO), autonomous simulation and digital twinning (AISE), to deliver safety, efficiency and resilience for sustainable port operations.

aidrivers.ai
OUR WORK HAS JUST BEGUN ON MARITIME DATA HARMONISATION

"WE NEED TO EXPAND WHO HAS ACCESS TO INFORMATION AND ENSURE THE INFORMATION IS TIMELY AND CORRECT."
Last month I concluded 5 months and 18 meetings with stakeholders and industry leaders for the Maritime Transportation Data Initiative (MTDI). Since January, every Tuesday afternoon for an hour we have met with representatives of key parts of the maritime supply chain. Meetings have included ocean carriers, marine terminal operators, railroad and trucking interests, equipment providers, Beneficial Cargo Owners (BCOs), distribution and warehousing centers, large integrators and other shipping intermediates, representatives of technology platforms, as well as federal government partners. I asked each participant about their key data and key data needs, data gaps, and gaps in data transfer. The goal for my initiative is to improve and solidify data synchronisation and standardisation and provide a roadmap for greater efficiency in supply chain distribution.

Throughout this process, I have been incredibly impressed with how willing the industry has been to engage in the MTDI process and how committed they are to making our supply chain better. I’ve noticed that most of our participants return to our weekly meetings or watch them on the FMC YouTube channel after they participated because they want to hear what others in the supply chain have to say on data. The industry stakeholders see first-hand every day in their businesses that these data issues must be resolved, and could enhance our system of movement, but they need to be shown a collaborative path forward and they are finding that path with the FMC.

Additionally, often data ownership and data sharing are conflated, and this raises concerns from industry. What the FMC is doing is identifying data elements that are already shared among members of the supply chain, not pushing for sharing confidential information. Too many times stakeholders are talking about the same thing but calling different names, or we have data being shared by one stakeholder that does not reflect real time status of shipment, and this all accrues to detriment of the entire system of cargo delivery.

We want to harmonise data that is already being shared among some — but not all — parties in the supply chain and ensure that the best information is provided by the best party to furnish information about the movement of cargo. We need to expand who has access to information and ensure the information is timely and correct, we need to strive for real time visibility to help the supply chain become more efficient. Already our system of movement of freight is incredibly complex, and without change, I can assure that we will continue to suffer rehabilitating macro-economic impact.

I am often asked how other initiatives and/or coalitions overlap or work with MTDI. The FMC’s Maritime Transportation Data Initiative is mission driven. The FMC is an independent regulatory agency that has oversight over the carriers, terminal operators, ports, and ocean shipping intermediates and other intermodal surface providers operators providing through service for international cargo shipments. The FMC is charged with responsibility on
ensuring an efficient ocean transportation supply chain and ensuring that the industry observes reasonable practices relating to or connected with receiving, handling, storing, or delivering cargo. Given the current economic dislocation caused in part due to supply chain disruption of ocean shipping, I believe that it is now incumbent to establish baseline standards for information that should be made publicly available for ocean shipping and our national and international supply chain. Once we have industry standards in place, the industry will be better placed to address the immensity of modern-day shipping challenges. Ultimately, national standards in this area will promote interoperability and facilitate a greater ability to predict and respond to shipping challenges.

For the most part, there is a general recognition of the need to move to greater standardisation and transparency. Maritime labour has raised some concerns about data collection in general, but we are very clear that this is about identifying existing data, naming it, and standardising it. We are not creating tools that measure performance. The MTDI is not collecting data and we are not seeking to access proprietary data. We are identifying and harmonising common data elements that are already being utilised within the supply chain to improve efficiency. Those working in the ocean transportation supply chain — on and off the docks — have done an incredible job of ensuring that the American consumers and producers were able to benefit from robust ocean shipping markets during an unprecedented pandemic. We should seek every tool available to make sure their hard work is not undermined by information gaps that idle ships, trucks, or warehouses.

Our 1 June 2022 Maritime Transportation Data Initiative (MTDI) will take the next step in harmonising maritime data. This will be a working summit. We will be identifying data gaps and proposing recommendations. All the panelists from our Tuesday meetings are invited to participate in person. We will have breakout sessions with participants to hammer out and refine our findings. There will be a virtual component as well. The summit plenary session will be open to the public. I encourage everyone interested in critically reviewing our recommendations, and participate in what I pledge to be open and accessible.

Carl W. Bentzel is a Commissioner with the U.S. Federal Maritime Commission. The thoughts and comments expressed here are his own and do not necessarily represent the position of the Commission.

ABOUT THE AUTHOR:
Commissioner Carl Bentzel was sworn into office on 9 December 2019. Prior to his appointment at the Federal Maritime Commission, Commissioner Bentzel created and established a consulting services company where he represented clients on regulatory and legislative issues within the areas of transportation, energy and other areas of federal regulatory oversight. Prior to working in the private sector, Mr. Bentzel served the public sector for 10 years as a Senate professional committee staffer including, most recently, as Senior Democratic Counsel of the Senate Committee on Commerce, Science & Transportation.

ABOUT THE ORGANISATION:
The Federal Maritime Commission (FMC) is the independent federal agency responsible for regulating the US international ocean transportation system for the benefit of US exporters, importers, and the US consumer.

“WE ARE VERY CLEAR THAT THIS IS ABOUT IDENTIFYING EXISTING DATA, NAMING IT, AND STANDARDISING IT. WE ARE NOT CREATING TOOLS THAT MEASURE PERFORMANCE.”
IPCSA’S NETWORK OF TRUSTED NETWORKS: DELIVERING PREDICTABILITY, VISIBILITY AND CERTAINTY WITHIN THE SUPPLY CHAIN
Port congestion, container shortages, supply chain delays and disruption — these have been the ‘headlines’ when it comes to global maritime trade over the past few months.

It’s clear that the whole supply chain and logistics sector, including ports, must find new ways to optimise operations, deliver efficiency, reduce waste, cut carbon and increase resilience.

It is widely accepted that a port’s success in the future will depend on that port becoming smarter in everything it does. What defines a ‘smart port’? That, of course, depends on where you start! But without doubt, effective digitalisation and the electronic exchange of information can and does play a vital role in the smooth and swift flow of cargo.

When the United Nations Conference on Trade and Development (UNCTAD) recently held an expert meeting to discuss the ongoing challenges in the maritime supply chain, the importance of Port Community Systems and end-to-end communication was emphasised by many speakers. As Captain Karuppiah Subramaniam, President of the International Association of Ports and Harbors (IAPH), said: “We need to have Single Window systems and Port Community Systems and end-to-end communication was emphasised by many speakers. As Captain Karuppiah Subramaniam, President of the International Association of Ports and Harbors (IAPH), said: “We need to have Single Window systems and Port Community Systems, so that data can be shared at the press of a button, with many parties simultaneously. Going forward, we need to link up with the stakeholders outside the port — warehousing, shipping agents, forwarders, Customs and others.”

None of this is ‘news’ to members of the International Port Community Systems Association (IPCSA). Some have been operating Port Community Systems for more than 40 years! Nevertheless, the increased focus on digital solutions, transparency, tracking and tracing of cargoes and real-time visibility is to be welcomed.

Port Community Systems operators provide the neutral, trusted, third-party platforms through which all stakeholders, from ship agents and hauliers to Customs and other government bodies, can exchange vital information in a secure way, without the need for duplication. The alternative to such systems can be mountains of unnecessary, time-consuming paperwork, mistakes, duplication of effort and long delays in Customs clearance — ultimately leading to containers and other cargo waiting in port for days or even weeks and not being cleared to continue their journey.

Ports can and will get smarter — of that there is no doubt. The opportunities are wide-ranging. But as we observe, and try to pin down, the rapid advances in technology, are we in danger of forgetting or eliminating the human side of ports and port work? The advance of digitalisation in all its forms will continue at pace, that’s clear. But ports and port operations that
have been successful up to now have been built on the experience, expertise and knowledge of real people. We need to ensure we keep building on that valuable asset.

It’s easy to see the parallels with creating, implementing and operating a Port Community System. At IPCSA, we also emphasise that creating a successful PCS is not about a specific technology – it’s all about creating trust and cooperation between the various stakeholders.

IPCSA, which celebrated its tenth anniversary in 2021, has 50 members, including Port Community System (PCS) and Cargo Community System (CCS) operators, Single Window operators, and seaport and airport authorities, drawn from all regions of the world.

A recognised NGO with consultative status at the International Maritime Organization and UNECOSOC, IPCSA works closely with UN/CEFACT, the World Customs Organization, the ISO and several other international bodies. It is valued across the globe for providing advice and guidance on the electronic exchange of information across borders and throughout the whole supply chain.

Alongside all of this, however, IPCSA’s primary focus remains firmly on its members. IPCSA is often praised for its openness and the ‘family’ feel of the organisation, with members willing to share and exchange their knowledge and experience on how they solved issues. We have a unique openness within IPCSA — our members like each other and trust each other.

We are also proud of our reputation for providing ports and regions with the support, advice and practical guidance they need in the development of a Port Community System or Single Window operation.

In short — we listen carefully and respond accordingly. We do not develop initiatives ‘for the sake of it’ but because they will add real value and service for our members and, ultimately, to the users of their Port Community Systems and Single Windows.

IPCSA’s Network of Trusted Networks (NoTN) is the perfect example. In embarking on this project, IPCSA was responding to the requirements of consumers and logistics companies for end-to-end information on their shipments. The NoTN is a unique, secure port-to-port and cross-border data exchange solution for supply chains. Via this platform, Port Community System operators, representing the interests of their customers, can exchange data relating to vessel/voyage information, and track and trace cargo globally.

The purpose of the NoTN is to provide predictability, visibility and certainty within the supply chain. Others have tried to deliver a concept like this, but the key stumbling block has always been ‘trust’. The direct users of the NoTN will be trusted, neutral platforms...
such as Port Community Systems, Cargo Community Systems and Single Window operators — it is a ‘trusted network’ because these platforms are the only users that have access and they will only share data that they are allowed to share by their users. Thus, the NoTN maintains the principle of commercial confidentiality, which is the cornerstone of Port Community Systems and Single Windows.

Five important APIs are already operational on the NoTN platform: Port Call (covering vessel time of arrival and departure); Cargo Status (status and details of the container in port — clearance, in/out of gate, origin and destination); UN/LOCODE (covering regulatory information for reporting, automatically updated); ISPS Code (International Ship and Port Facility Security Code, providing security information on previous and following ports, helping validation and avoiding duplication); and BIC Codes (Bureau International des Containers Location Codes, which eliminate confusion and ensure standardisation of references).

In the coming months, we will announce the incorporation of more APIs which will increase exponentially the capacity of data sharing.

At present, the Network of Trusted Networks is in its pilot phase, with IPCSA members using the platform to exchange data to ensure credibility and validity of the work. The project working group is looking to roll out the NoTN beyond 2023, with the possibility of offering the solution to non-IPCSA members.

Further ahead, there are multiple options for ongoing development in response to market needs; we expect our early users to propose new APIs and feedback on what other information could usefully be exchanges via the NoTN.

As with all Port Community Systems and Single Windows, this is a real community-driven solution. The NoTN can be, to a large extent,
what the users want it to be. Its development and rollout is far more about managing relationships and creating trust between parties, rather than the IT nuts and bolts. The data being exchanged is all encrypted — no one sees it except for the sender and receiver. The NoTN is the ‘bridge’ and does not store the data that is exchanged.

One of the early participants is PortNet, Morocco’s national trade Single Window. The country’s 13 ports thus already have access to the NoTN, and it is likely that its 17 airports could also link to the solution.

IPCSA welcomes all enquiries – we are always keen to help. To find out more about the benefits of Port Community Systems, the NoTN and IPCSA, please visit www.ipcsa.international and www.ipcsa.international/initiatives/network-of-trusted-networks/

ABOUT THE AUTHOR
Inga Mortona is General Manager of the International Port Community Systems Association (IPCSA). A specialist in European Union and international law, she provides administrative support and expertise relating to policy makers. Inga Mortona has extensive knowledge and experience across legislative, finance, data protection, competition law and strategic planning issues, having worked at a high level in both governmental and commercial sectors, including at the Freeport of Riga. She is fluent in Russian, Latvian, Lithuanian and English.

ABOUT THE ORGANISATION
The International Port Community Systems Association is an international association of sea and air port community system operators, sea and air port authorities and Single Window operators that is recognised across the globe for providing advice and guidance on the electronic exchange of information across borders and throughout the whole supply chain.

The association has members from across the globe who handle the exchange of information for Business to Business, Government to Business and Government to Government processes and facilitate the smooth cross-border movement of goods. This equates to the electronic exchange of information relating to more than 500 million TEU movements and 10 billion tonnes of cargo for air, sea and land transport – estimated to be in excess of 50 billion exchanges every year.

“AS WITH ALL PORT COMMUNITY SYSTEMS AND SINGLE WINDOWS, THIS IS A REAL COMMUNITY-DRIVEN SOLUTION. THE NOTN CAN BE WHAT THE USERS WANT IT TO BE.”
CREATING A BLUEPRINT FOR THE DECARBONISATION OF UK PORTS

“THIS SYSTEM IS GOING TO BE THE LYNCHPIN FOR OUR FUTURE ENERGY PLANS AND HOPEFULLY OUR WIDER ENVIRONMENTAL PLANS FOR THE NEXT 50 OR 100 YEARS.”
In March 2021 Innovate UK put out a call for applications for its Clean Maritime Demonstration Competition, which provides R&D funding for technology that could help accelerate the decarbonisation of the maritime industry.

Here in the North East, a consortium called the Clean Tyne project answered the call and, just six months since we received funding, our new digital platform is in operation at the Port of Tyne, providing real-time data on the port’s energy use and giving future modelling which will help us reduce carbon emissions.

Basically, we can now monitor and evaluate our current and future energy consumption, and make decisions about our transition to net zero which are based on real-time data.

**MODELLING CURRENT AND FUTURE SCENARIOS**

So, how does the new platform work?

We feed the port’s data into the digital platform — such as the number of ships at berth, or information relating to our container storage — and it gives us visualisations showing our current energy usage across the entire site.

Thanks to the work of Siemens and Newcastle University, we can also use the platform to model future scenarios. So, for example, we’re planning on converting all our mobile cranes from diesel to electric. The digital platform allows us to model this transition and find out if we have the grid capacity to charge all the new cranes simultaneously. It means that we know what our costs and usage will be in the future and it allows us to prioritise plans which will give the best return on investment. Another benefit is that it provides a common language for discussing energy usage across all our teams and operations.

**INFORMING DIGITALISATION OF PORT PROCESSES**

Our aim is that the Port of Tyne will be carbon neutral by 2030 and this tool will help us to get there.

It is already providing data that helps inform the digitalisation of various processes: the Port of Tyne...
“OTHER POSSIBILITIES BROUGHT BY 5G COULD BE THE ABILITY TO USE SMART LOCATION ON OUR CONTAINERS, USING GPRS, COMBINED WITH RUBBER-TYRED GANTRIES INSTEAD OF THE CURRENT REACH STACKERS.”

is looking to establish its private 5G network this year and as part of this we're anticipating being able to install numerous sensors which will allow us to measure cycle times and fuel usage of machinery and prioritise replacements based on efficiency — which could mean replacing diesel forklifts with electric, for example.

Other possibilities brought by 5G could be the ability to use smart location on our containers, using GPRS, combined with rubber-tyred gantries instead of the current reach stackers. This could not only save space but could vastly reduce the number of moves we need to make when moving containers — reducing energy, saving time, and generally being a smarter way to run the compound.

The Clean Tyne platform means we can model these future scenarios in advance and see how they will work in reality.

And already the data we’re receiving is giving useful insights into how we can achieve a carbon neutral status quickly and cost-effectively. Dr. Haris Patsios, Senior Lecturer in Power Systems at Newcastle University explained: “Our modelling results suggest that the degree of electrification of key port assets plays a very important role in the effect that digitalisation of port activities can have on the pathway to net zero.

“So there’s a good possibility that trying to electrify and coordinate earlier might yield significant benefits, even before installation of renewable power generation takes place at the port and even if the port still depends significantly on grid power.”

POTENTIAL FOR BROADER USES

The system is brand new but we can already see its potential. There’s a lot we can do with it.

We have more data and information we would like to feed into the platform and we want to explore more avenues, like whether we can use it to encompass more of our environmental work around waste and emissions.

This system is going to be the lynchpin for our future energy plans and hopefully our wider environmental plans for the next 50 or 100 years.
A MULTI-DISCIPLINARY TEAM

The Clean Tyne consortium brings together a multidisciplinary team: Connected Places Catapult, Newcastle University, the North East Local Enterprise Partnership (LEP), the Port of Tyne and Siemens.

The Newcastle University team provided the foundations for the development of the new digital platform, in the form of energy-related data and the modelling of future scenarios.

Connected Places Catapult exists to accelerate the adoption of new technologies like this in the market and has been working with the Clean Tyne partners to identify opportunities to roll this out further.

The North East LEP leads the North East Energy Catalyst, which is itself a partnership of the region's leading energy innovators. The catalyst will use the findings of the Clean Tyne project to help other North East SMEs develop products and services that can help us in the journey to net zero.

Using the Port of Tyne as a testbed, the Clean Tyne project’s digital energy platform has enabled Siemens and its partners to develop a universal blueprint for decarbonisation that can be replicated in other port environments as well as other industries.

As well as pushing through the project remarkably quickly, the creation of the consortium has helped bridge the gap between academia and industry.

SHARING FINDINGS AND CREATING A BLUEPRINT

We believe this blueprint can be used by any port in the UK and that’s part of the ethos of the 2050 Maritime Innovation Hub here at the Port of Tyne. Whatever we learn, we want to share as we want to take the sector forward and align ourselves and the wider sector with the UK Government’s Maritime 2050 strategy.

Several follow-on, larger scale demonstrator projects have been identified and the consortium can see opportunities for this technology to be used both within the maritime sector and elsewhere.

David Lynch, Energy Innovation Partnership Manager at the North East LEP, said: “Like ports, places like airports, business sites and shopping centres all have energy needs and are all looking at reducing carbon emissions. I want to explore how we can bring organisations together to help more sites like these decarbonise.

“This initial rollout at the Port of Tyne acts as a demonstrator and people will be able to see how the system could be adapted for use in other places. There’s an initial investment to be made, but it de-risks decision-making and future investments as it provides information that was previously missing.”

The Clean Tyne project has underlined the role ports have to play in the UK’s overall journey towards net-zero. Thomas White from Connected Places Catapult commented: “Ports operate at the intersection of many future energy sources, including wave, tidal, onshore and offshore wind and solar, and supporting the growth of these renewable energies is essential to the future energy security and decarbonisation of the UK economy.

“The Clean Tyne project has put in place the ‘digital foundations’ of a smart, future energy system which will help the port’s own transition to net-zero and which will result in learning which we can share with other ports and organisations around the UK.”

If you’d like to find out more about the Clean Tyne project and how it could be used, contact Ian.Blake@portoftyne.co.uk.

ABOUT THE AUTHOR:

Ian Blake, Head of Innovation and Technology, Port of Tyne. Ian has over 20 years’ experience in the maritime sector and he is currently responsible for IT strategy, security and governance, IT infrastructure and services across all areas of the Port. In addition, Ian is one of the innovation leads for the 2050 Innovation Hub, which is the UK’s first Maritime Innovation Hub which connects businesses and academia from diverse industries to collaborate and create solutions for the maritime and logistics sectors.

ABOUT THE ORGANISATION:

Port of Tyne is one of the UK’s major deep-sea ports – operating in bulk and conventional cargo, car terminals, cruise & ferry, port centric logistics and estates. Overall, the Port of Tyne enables £557 million to be added to the North East economy, supporting 9,300 jobs directly and indirectly. The Port’s cruise and ferry business adds another £57 million to the local economy and 1,600 jobs.

“PORTS OPERATE AT THE INTERSECTION OF MANY FUTURE ENERGY SOURCES, INCLUDING WAVE, TIDAL, ONSHORE AND OFFSHORE WIND AND SOLAR, AND SUPPORTING THE GROWTH OF THESE ENERGIES IS ESSENTIAL”
SOME THINK SHIP LOADING CANNOT BE CUSTOMISED.
WE THINK DIFFERENT.
Westwell Unveils Q-Truck, the World's First Mass-Produced, Fully Autonomous Commercial Vehicle, at the SDP Conference

Exploring the Optimal Relationship between Human Beings and AI to Support Global Intelligent Port Construction

From 11 to 12 May 2022, Westwell, an AI company with full-stack development capabilities, attended the Smart Digital Ports (SDP) conference with Q-Truck – the world’s first fully autonomous heavy truck, self-developed and already mass-produced. This year, our ‘cableless’ battery-electric heavy truck has been upgraded with an intelligent power swap feature. It can be recharged unattended with its charging time reduced from 2 hours to 6 minutes.

We believe in drawing on human wisdom and using it to benefit mankind – “From Human to Human”. We take AI technology as an anchor and combine it with autonomous driving to boost green and intelligent port transformation. Westwell cooperates with more than 90 business clients and now operates in ports and large logistics parks globally. Q-Truck, a fully autonomous commercial vehicle highlighted here, is another milestone in our efforts to support the global intelligent and green port transformation.

From Human: Removing the Cab

We have removed the cab in Q-Truck and installed a battery and cooling system at its front end to protect its core hardware from the complex working conditions that can be encountered in port operations. The truck is equipped with industri-al-grade sensors such as binocular AI cameras, LiDARS, and millimetre wave radars. It can perform ultra-precise positioning and identification by using a complete full-stack system. This allows Q-Truck to travel 200 kilometres with an 80-ton load on a full charge without having to lay underground magnetic transponder. Q-Truck can smoothly perform intelligent operations such as turning, lane changing, and safe overtaking. Q-Truck can be fully integrated into port operations. Wireless sensors provide 360-degree coverage of the container truck without blind spots.

To Human: Completed Commercial Deployment in Many Ports Worldwide

The Q-Truck fleet has been commercially deployed in Thailand and the United Arab Emirates. At the Laem Chabang Port in Thailand, the world’s first AI terminal for manned and unmanned truck operations built by Hutchison Ports and Westwell is now in full commercial operation. As of April 2022, Westwell has completed 110,000 TEU vessel operations in 20 months in Thailand. The autonomous Q-Truck fleet has now been fully delivered for local user operation, which is a world first.

In 2021, the autonomous Q-Truck fleet was delivered to COSCO Shipping’s Khalifa Port Phase II terminal in Abu Dhabi, UAE, supporting Khalifa Port to become the first port in the Middle East to employ autonomous driving technology.

Currently, Westwell has around 100 autonomous vehicles around the globe, including the autonomous Q-Truck fleet, the intelligent straddle carrier assisting ZPMC, and the IGV platform-based autonomous driving system for China’s Tianjin Port and Xiamen Port.

In the perspective of intelligent horizontal transport at ports, Westwell boasts a full set of mature and green software/hardware commercial solutions that integrate advanced technologies such as individual vehicle intelligence, fleet management, pioneering intelligent navigation and positioning, artificial intelligence, visual identity, and self-learning. Together with the simulated operation based on WellSim, we can simulate data under different illumination, weather, and sensor conditions, so as to achieve offline module training and pre-operation. The intelligent vehicle dispatching and management system WellFMS can be interconnected with the terminal management system (TOS), yard crane/quay crane equipment control system, and intelligent horizontal transport equipment, to achieve unified dispatching and management of all autonomous equipment. This allows for a full lifecycle carbon lean management of autonomous driving, and provides users with optimised solutions to operational procedures and overall deployment through multi-dimensional refined data mining.

The successful implementation of Westwell’s autonomous driving in many commercial scenarios proves that Westwell can achieve the genuine mixed operations of both manned and unmanned vehicles in the port area or park area, regardless of the ship type and with no need for infrastructure reconstruction such as underground magnetic transponder laying or access control area setting for physical isolation. Therefore, Westwell’s solutions are ideally suited to the fast intelligent upgrade of traditional container terminals that are in operation, to reduce energy consumption and comprehensively improve operational efficiency.

Kenny Tan, the founder and CEO of Westwell, said: “From redefining the fully autonomous commercial vehicle – Q-Truck -- to creating the first operation-based commercial model using autonomous driving, Westwell has always had people as our starting point. We have been continuously pinpointing, expanding and optimising the optimal relationship between human beings and AI.

“In the future, Westwell will continue to empower the circulation and operation of production elements with technology to help port companies reduce costs, increase efficiency and ensure operational safety. Our model aims to lead the world in intelligent port upgrades and low-carbon port development.”
HARNESSING THE POWER OF DATA TO ADDRESS SUPPLY CHAIN CHALLENGES

“PORT OPTIMIZER AGGREGATES NON-PROPRIETARY MARITIME SHIPPING DATA, INTERPRETING THAT DATA IN RELEVANT WAYS AND MAKING IT USABLE BY PORT USERS AS SOON AS IT IS AVAILABLE.”
The COVID-19-impacted global supply chain was the first big test for port community systems at major international ports. L.A.’s Port Optimizer™ showed digitalisation’s potential for improving ocean trade performance.

During the past two years, ports around the world have witnessed some of the biggest cargo congestion challenges in modern history. Supply chains on nearly every continent have been challenged by logistical disruptions, affecting billions of lives and livelihoods.

Operating some of the busiest trade lanes in the Western Hemisphere, Los Angeles and other US West Coast ports have been significantly impacted by unprecedented levels of consumer-driven imports since the summer of 2020. Even before COVID-19, however, trade policies enacted in 2018 began influencing shipper behavior, accelerating supply chain cycles as cargo owners rushed to ship their goods in advance of costly and escalating tariff deadlines. As a result, 2018 was a record year fueled by surges in import volume.

For the Port of Los Angeles, every possible solution has been on the table to manage these cargo surges since their emergence, including fast-tracking the development of its port community system, Port Optimizer™. From the time Port Optimizer was deployed in 2017, this cloud-based digital portal has continually added new features in response to these extraordinary supply chain conditions, providing port community stakeholders with forward-looking and real-time operational intelligence, and enabling Los Angeles to process record levels of monthly TEU volumes.

**PORT OPTIMIZER™ TECHNOLOGY**

A collaboration between the Port of Los Angeles and Wabtec Corporation, Port Optimizer helps cargo owners and service providers — including terminal, drayage and rail operators — better predict, plan and track cargo flows through the San Pedro Bay. Port Optimizer aggregates non-proprietary maritime shipping data, interpreting that data in relevant ways and making it usable by port users as soon as it is available. Data specific to a particular company’s cargo flow is also available through secure, channeled access, and can be integrated through Application Programming Interfaces (API) into the company’s own system.

Port Optimizer and the insights it provides help port users operate more efficiently and move their cargo through the port in a more predictable and timely manner. It provides greater visibility and line-of-sight planning capability from port of origin, through Los Angeles and on to the final destination.

The system collects diverse cargo data flows from a number of sources, including U.S.
“CARGO FLOW DYNAMICS DURING COVID-19 HAS PUT PORT OPTIMIZER TO THE TEST AND, IN SOME RESPECTS, ACCELERATED ITS EVOLUTION.”

Customs and Border Protection, ocean carriers, marine terminals, railroads, drayage and other port stakeholders. This multi-sourced data then feeds into Port Optimizer, which is able to receive, process and make sense of data in varying formats, whether a spreadsheet, email, BAYPlan Including Empties (BAPLIE), Electronic Data Interface (EDI), API or other nonstandard data feeds. The data is then synthesised through the system into an easy-to-use, visualised interface.

IMPROVED PLANNING AND VISIBILITY IN A PANDEMIC

Port Optimizer has continued to evolve over the years, with new features added based on user feedback and changing conditions in the supply chain. Cargo flow dynamics during COVID-19 has put Port Optimizer to the test and, in some respects, accelerated its evolution.

New Port Optimizer features that the port makes available on its website daily at no cost to users include:

- **Control Tower:** As the primary dashboard to access all new publicly available Port Optimizer features, the Control Tower lets users view historical containerised volumes by terminal, shipping line and vessel, in addition to trending volumes by terminal, service and vessel. It offers a real-time port-level view of truck turn times by terminal, as well as real-time totals of the number of containers discharged from vessels and currently on the terminal.

- **Signal:** This feature provides a daily view of current containerised import volumes, projected container arrivals and current vessels at anchorage. The data is broken down by container type and includes details on the mode of transportation, whether rail or truck, once a container arrives in Los Angeles.
• **Return Signal:** Key to improving drayage efficiency, this application informs a user when and where truckers can return empty containers to cargo terminals accepting empties throughout the port complex.

• **Horizon:** This feature forecasts cargo movement up to six months in advance, and gauges movement of containers, including imports, exports and empty containers.

These latest enhancements provide visibility into operating conditions at all 12 terminals at the Port of Los Angeles and captures 70 per cent of the import data for the entire San Pedro Bay port complex.

**LOOKING AHEAD**

COVID-19 supply chain disruptions have underscored the need for port communities that provide awareness of upstream and downstream cargo flow, and the ability to provide visibility on all aspects of the supply chain that impact port cargo operations.

The power of digitisation has brought to surface three key factors in addressing recent supply chain challenges: visibility, analytics and exception management.

Visibility of the data helps the port and other Port Optimizer users diagnose system conditions that could create bottlenecks in cargo flows. This allows users to dive further into the analytics that can be critical in identifying and enabling corrective action. Taken together these data sets provide the ability to address exception management for key customer pain points, and pivot quickly to other possible options. Overall, the ability to see around corners of daily operations helps each operational link in the supply chain perform at more optimal levels.

This is why Port Optimizer has been a game changer for the Port of Los Angeles.

By enhancing supply chain performance through real-time, data-driven insights in a single portal, Port Optimizer has helped marine terminal customers, labour, rail, drayage and cargo owners served at the port to work in a lockstep fashion and identify supply chain issues before they evolve into more challenging operational circumstances. It has provided insights that can be developed into actionable solutions. It has also given the port the ability to effectively disseminate critical and accurate information to cargo stakeholders more quickly, an added value to Port of Los Angeles users during the COVID-19 pandemic.

Challenges of the supply chain related to the pandemic are far from over, and will take time to resolve. However, we now know — regardless of the operating conditions — that effective data collection, data sharing and information exchange across a port ecosystem delivers operational

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**Smart Digital Ports of the Future**

**Port of Los Angeles**
advantages, maximising line-of-sight visibility, predictability and throughput for all nodes in the supply chain.

Port Optimizer is a solid start to what’s possible for the digital transformation of the maritime industry here in the US. It’s a strong technology foundation that the Port of Los Angeles and Wabtec will continue to build upon and evolve in the years ahead.

The Port of Los Angeles, however, is just one trade US gateway among dozens here in the US. Establishing port community systems at every major US port — systems capable of exchanging common sets of key data — could go a long way toward building a nationwide system capable of providing real-time operational intelligence across the entire ocean supply chain. The development of this ‘system of systems’ would be another game changer with enormous potential.

**ABOUT THE AUTHOR:**
Eric Caris is Director of Cargo Marketing the Port of Los Angeles, North America’s leading seaport by container volume and cargo value. Jim Dietz is Senior Director, Product Solutions, at Wabtec a leading global provider of equipment, systems, digital solutions and value-added services for the freight and transit rail industries.

**ABOUT THE ORGANISATION:**
The Port of Los Angeles is America’s Port, the nation’s premier gateway for international commerce and the busiest seaport in the Western Hemisphere. Located in San Pedro Bay, 25 miles south of downtown Los Angeles, the Port encompasses 7,500 acres of land and water along 43 miles of waterfront.

Jointly developed by the Port of Los Angeles and Wabtec, Port Optimizer is a dynamic cloud-based information portal that digitises maritime shipping data for supply chain stakeholders. First introduced by the Port of Los Angeles in 2017, the digital platform has continually added new application features.

“BY ENHANCING SUPPLY CHAIN PERFORMANCE THROUGH REAL-TIME, DATA-DRIVEN INSIGHTS IN A SINGLE PORTAL, PORT OPTIMIZER HAS HELPED MARINE TERMINAL CUSTOMERS, LABOUR, RAIL, DRAYAGE AND CARGO OWNERS SERVED AT THE PORT TO WORK IN A LOCKSTEP FASHION.”
YOU WANT SMART INNOVATION? GET THE COMMUNITY INVOLVED!

“INNOVATION IS NOT A PURPOSE IN ITS OWN RIGHT – THERE MUST BE A REASON FOR IT.”
The advance of smart ports is gathering pace, and it’s noticeable that more and more people from ‘outside’ the traditional world of maritime are getting involved, from young start-ups to individuals with deep experience gained elsewhere.

Gone are the days of anonymous IT teams tucked away in the basement, only called out when the printer didn’t work! Today, digitalisation is taking centre stage in the ports industry.

Port Community Systems (PCS) were there at the start, of course. It was back in the 1980s when the first PCSs were created — neutral, trusted third parties providing a platform for the efficient electronic exchange of information. For more than 40 years, PCSs have worked to eliminate the paperchase, avoid duplication of effort and get rid of bottlenecks in ports. Information is made speedily and readily available, so that cargo can flow smoothly through the port and to its destination without unnecessary delays.

The PCS was, and remains, a smart idea at the centre of efficient ports. But the role of the PCS doesn’t stop there. Increasingly, Port Community Systems and Single Window systems are introducing new functions and services themselves, while also providing the platform for smart technologies and solutions being put in place across the port. At the same time, PCSs provide the perfect example of collaborative working and bringing together a community to create new solutions together.

IPCSA member Tanger Med Port Authority operates the number one container port in the Mediterranean and Africa. Tanger Med is both a major transshipment hub for containers and the leading import/export port for cargo flows between Morocco and Africa, with more than 400,000 trucks processed in 2021.

In November 2021, the port complex announced that all import and export formalities and processes for container and truck activities at the port would be digitalised. The aim: fluidity of operations, a high level of security, transparency, predictability and competitiveness.

Via smartphone, tablet or computer, users access the service through the Tanger Med Port Community System, which was already offering services such as traceability of freight units, flow management, remote billing and online payment.

"We call it Zero Paper because it aims to make the process and applications involved in this flow management totally paperless," said Ridouan Boulaich, Chief Information Officer at Tanger Med.

"The digital system that handles this import/export operation — the freight system — is separate to the PCS but the stakeholders access the module through the PCS, which was upgraded to allow this exchange of information."

What makes the system special is the in-house and global digital approach, he said. "We are creating a more digital ecosystem internally — it is complementary between business, digital and IT."

It has been almost two years since Tanger Med started to build this global solution, and communication with stakeholders and partners was vital in the process, said Boulaich.

"Cross-border trade is one of the key pillars of the Moroccan economy — so all optimisations are more than welcome. We gradually started to use new applications. "We needed to optimise processes, save time, facilitate the exchange of information — and all
in the best way to interact with our customers' business. Our port users are already pleased with the results. They can follow the status of their goods, and conduct their business more efficiently.”

The port authority has strengthened the PCS’s positioning over the past two years, introducing new modules ranging from vessel slots and priority berthing management solution, through to Customs declarations, gate in/gate out and digitalisation of the entire agricultural foods export process to ensure compliance with standards and border controls.

Chief Digital Officer Chawki Benouarrek said: “Tanger Med is committed to a digital roadmap strategy. We are looking towards the future — we believe we have reached the point when we have made the necessary investments in state-of-the-art infrastructure and this has to be matched by our ambitions in terms of strategy. One of these is to be in the top 20 ports worldwide — and we know that digital transformation is going to get us there.”

Among these new and cutting-edge services is the digital secured freight release that has allowed the aggregation of several documents (Bill of Lading, Release Order, Customs Control Decisions, Customs Hands Off, Transport Orders) with a single release code issued directly to the transporter.

A digital roadmap drawn up for the next four years has led to nearly 30 projects, ranging from asset management, predictive maintenance and sensors placed around the port to support with maintenance, to traffic management and ship movement optimisation.

“The idea is that in four years we will have implemented all these solutions,” said Benouarrek.

“It is ambitious. Also, there is a lot of focus on blockchain and other technologies which will help us better understand and leverage the data we have. We gather huge volumes of valuable data around traffic management, import/export, and so on, and we want to use, analyse and understand this to get more insight, predict better and improve our business.”

Having come to Tanger Med from outside the industry, he saw a sector “quite behind others” in terms of digitalisation.

However, he said: “The ports industry is catching up fast. Ports that don’t do this will be left behind, to put it mildly. You cannot escape it — becoming a truly smart port is something you must do to be able to compete.”

Another IPCSA member, Antwerp Port Authority, has been developing, implementing and championing numerous projects and initiatives around digitalisation. However, Nico De Cauwer, Senior Business Architect Digitalisation & Port Community Projects at the Port of Antwerp (and IPCSA’s Lead on standardisation and technology) emphasises that innovation is not a purpose in its own right — there must be a reason for it.

“Some people say they are innovative just because they are using emerging technologies,” he said. “In some cases, it does seem as if they feel they should be doing something only because everyone else is.”

For the Port of Antwerp, innovation has to match its mission (“A home port vital for a sustainable future”) and the related strategic priorities, De Cauwer noted. If it doesn’t fit, it doesn’t happen.

“As one of the leading ports in the world, the Port of Antwerp aspires to be the ‘Port of the Future,’” he said.

“It uses innovation as a lever to turn today’s major challenges such as energy transition, digitalisation and mobility into solutions. Through collaboration and the implementation of new technologies, it continues to build on the sustainable growth of the port and make it more efficient, safe and smart.”

The port has three clear, strategic priorities: growing and handling more volumes, but in a sustainable way; organisational resilience — COVID-19 has proved the need to be resilient and able to move fast in a changing world both as a company and
in its digital infrastructure; and transition, which covers both energy and digital transition. Digital transformation is the "enabler and catalyst" for achieving strategic goals, said the port.

For 10 years now, Antwerp has been really emphasising community building, not only through its PCS but also in applications such as its barge traffic system and rail traffic system. Community building will remain a huge part of the digital transition, De Cauwer said.

He is reluctant to make big claims about being 'smart'. De Cauwer added: "We feel that saying that today you are a smart port implies that your ancestors who developed the port over the last 200 years were really not doing a smart job. And that is not the case — they also did very smart things, like building the new docks making the port area what it is today!"

He refers to the definition produced by SPEED (Smart Ports Ecosystem of the European 2 Seas), a European Interreg project. A smart port is built on operational efficiency, sustainability, resilience and innovation.

"Everyone can do a nice pilot project with drones and say they are a smart port, but you have to always see and evaluate things in combination with the four pillars in the definition," he said.

In the move towards a 'smart' port, Antwerp argues the capabilities to make your efforts sustainable are: integration and operational efficiency of port operations; balanced and adaptive modal shifts; robust end-to-end cybersecurity; performance and efficiency in energy and ecology; and a digital talent pool and ecosystems.

The port concentrates on both the internal innovation culture — making employees aware of innovation and working with them to see what innovation can do for day-to-day business (if you can’t show them a use case with a drone, the project will hit a brick wall straight away); and 'outside in' — attracting external companies doing innovative things making use of the port’s assets and infrastructure.

A good example is Seafar, which is controlling multiple autonomous barges in Flanders; five years ago, the Seafar team brought their tech to the port, and the port provided a dock and a vessel on which to test the system.

"They started to experiment and could clearly show that this worked. Today they are operating their technology on autonomous barges in a commercial context," De Cauwer said.

"That is how we work — we are not pretending we can do it all with our own people. We want to attract external companies with..."
new technologies and do some co-creation.”

The Beacon, located near the port authority building, provides a base for innovation. Set up by the port authority, city and University of Antwerp to attract start-ups, it is now home to about 60 of the companies, ranging from two-people businesses up to others scaling up rapidly. Seafar started out in The Beacon.

Among the numerous projects ongoing in the port, drones are providing services to detect oil spills quickly for prompt response; to detect litter; to inspect infrastructure such as fenders, bridges and radar towers, taking pictures and highlighting any maintenance or damage issues; and to support vessel and berthing management. An ‘Echodrone’ provides automated surveying of water depths.

A recent major fire in a warehouse full of timber was tackled by the fire department with support from the port authority’s drone service; the drone relayed live pictures and infrared images via a 4G connection to the incident room. Anyone glancing at the ordinary photographs might have concluded that the fire was out — but the infrared images showed where it was smouldering underneath, helping the firefighters to pinpoint where work was needed. This was a perfect example of the way that drones can support safety in the port.

A key element in being a leading smart port is APICA (Antwerp Port Information & Control Assistant). This is a virtual assistant, based on a digital nervous system with smart cameras, drones, sensors for air and water quality, and combining all this data into a virtual model (digital twin) of the port. APICA provides real time information on ship movements, flows of dangerous goods, air quality and weather conditions, but also detection of oil spills or conducts inspections of maritime infrastructure. As De Cauwer said: “We are constantly looking for innovation enablement. Working with external companies, with internal employees and with the wider community will help to accelerate projects that tie in with our strategy and priorities.”

ABOUT THE AUTHOR
Richard Morton has been Secretary General of the International Port Community Systems Association (IPCSA) since its beginnings as a European organisation in 2011.

As an expert in trade facilitation and the exchange of electronic information, Richard is in demand across the globe as an adviser and speaker. He is a member of the Experts Committee of the APEC E-Commerce Business Alliance and an Expert at UN/CEFACT.

ABOUT THE ORGANISATION
The International Port Community Systems Association is an international association of sea and air port community system operators, sea and air port authorities and Single Window operators that is recognised across the globe for providing advice and guidance on the electronic exchange of information across borders and throughout the whole supply chain.

The association has members from across the globe who handle the exchange of information for Business to Business, Government to Business and Government to Government processes and facilitate the smooth cross-border movement of goods. This equates to the electronic exchange of information relating to more than 500 million TEU movements and 10 billion tonnes of cargo for air, sea and land transport – estimated to be in excess of 50 billion exchanges every year.

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