STEAM

Sea Traffic Management in the Eastern Mediterranean

NEWSLETTER

February 2020

IN THIS ISSUE

STEAM (INTEGRATED/0916/0063) is co-financed by the European Regional Development Fund and the Republic of Cyprus through the Research Promotion Foundation.

Structural Funds of the European Union in Cyprus

Republic of Cyprus

European Union
European Regional Development Fund

STEAM 2019 Overview

2019 has been a very productive first year for the STEAM project with some important developments and publications, many of which you will have the chance to read about in this newsletter.

We had our project kickoff meeting in February and two more Living Lab meetings at the Port of Limassol. There were considerable efforts in establishing the commercial PortCDM platform and the Limassol Shore Center. This involved identifying gaps in the port call process through interviews with the shipping agents, the terminals, and the VTS operators. The Ship Tracking Intelligence Platform was enhanced with data coming from additional AIS stations that were installed on the coast of Cyprus. Moreover, an environmental monitoring plan was designed and put into motion, tailored according to the needs of the local port actors. Last but not least, important achievements were made with respect to data management, cleaning, and validation.

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STEAM Publications

The United Nations now acknowledges PortCDM (Port Collaborative Decision Making) as an enabler for enhanced performance in Short Sea Shipping based on a study made on the role of improved collaboration and data sharing between ports. The article published at UNCTAD (United Nations Conference on Trade and Development) was authored by Mikael Lind (Research Institutes of Sweden - RISE - and Chalmers University of Technology, Sweden); Michalis Michaelides (Cyprus University of Technology - CUT, Cyprus); Robert Ward (RISE), Herodotos Herodotou (CUT), and Richard T. Watson (RISE and University of Georgia, USA). This study focuses on Short Sea Shipping in the Eastern Mediterranean for port calls made at the Port of Limassol, Cyprus and provides essentially a summary of the journal article "Port-2-Port Communication Enhancing Short Sea Shipping Performance: The Case Study of Cyprus and the Eastern Mediterranean", which was recently published in the MDPI Sustainability Journal.

[1] UNCTAD Newsletter: "Boosting data-sharing to improve Short Sea Shipping Performance: Evidence from Limassol port calls analysis" https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=2102

[2] The MDPI Sustainability Journal on "Port-2-Port Communication Enhancing Short Sea Shipping Performance: The Case Study of Cyprus and the Eastern Mediterranean" https://www.mdpi.com/2071-1050/11/7/1912

International PortCDM Council

During the work on the STM Validation project, the International PortCDM Council (IPCDMC) has been created as a sustainable organization governing the PortCDM concept and making it a reality, even after the end of the STMV project.

Highly inspired by the Airport CDM council, the PortCDM council with its global reach, aims for establishing the necessary overarching guidelines, processes, and procedures to make PortCDM a successful international concept in order to improve maritime transport as it relates to Port operations and Ports interaction with ships.

The partners of the STEAM project have been instrumental in establishing and running IPCDMC. I highly appreciate the dedication and work of STEAM and ensure our support for a successful completion of the project.

Michael Bergmann
Secretary IPCDMC
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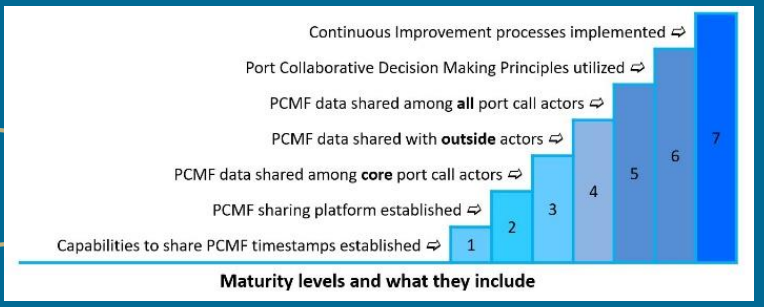
PortCDM Implementation

Since its inauguration in March 2017, the IPCDMC has made substantial developments with direct effects on the STEAM project.

The IPCDMC has migrated the Port Call Message Format, developed during the STM Validation Project, into a format compliant with the IMO Common Maritime Data Structure. The standard has been assigned the number S-211, it is endorsed by IALA, and it is now fully adopted in the registry. For STEAM this means that an international recognized standard is available and can be used. Additionally, operational guidelines had been established to guide PortCDM implementations. Those guidelines both are benefitting from the work in STEAM as well as they can be used to inspire the work within the project. Same is true for the IPCDMC Compliancy documents currently under final development.

The IPCDMC Working Groups (WGs), especially the Technical and Operational WGs, are very much looking forward to including the learnings from STEAM as well as the artifacts of STEAM to further refine PortCDM and pioneer its implementation.



RISE in the STEAM Project

For almost ten years, the Research Institutes of Sweden (RISE) has pursued applied research and developed innovations associated with port collaborative decision making (PortCDM). As the innovation of PortCDM has been highly valued by the industry as a concept for enabling ship and port operations to be much better integrated, RISE is now supporting diverse implementation initiatives on a global level, building upon the principles of PortCDM for ports of the world to become highly integrated in the global transport chain. Being a partner in the STEAM project is important to both support the further development of the efforts already pursued in the Port of Limassol through the validation of the PortCDM concept within the STM validation project as well as contributing to helping ensure that the ports of Cyprus are among the pioneering ports of the world that fully adopt the principles of PortCDM and thereby become leaders and examples for other ports to follow.

The principles of PortCDM are well aligned to support the environmental initiatives that are now prominent in IMO, such as just-in-time shipping. Just-in-time shipping will rely on ports being able to support collaborative decision making, and improved coordination, synchronization, and data sharing that PortCDM can provide.

Building upon the ambitions that Cyprus has to strengthen its transshipment and information hub capabilities for the eastern Mediterranean, and becoming more connected to the ports in the region, the PortCDM concept, which comes with operational and technical guidelines for its implementation, is ideal to guide the upgrade of existing tools and procedures.

Through the STEAM project, the ports in Cyprus can be expected to experience and demonstrate the beneficial effects coming out of adopting full PortCDM capabilities. Important enablers for such a development are that the port call actors are coordinated, and that the port manages to expand its planning horizons by being able to access information about expected and conducted ship movements as well as progress in ports of origin. The STEAM project is well equipped to bring this forward.

By building upon an internationally accepted message format for sharing port call messages (timestamps) associated to intentions, outcomes (actuals), and recommendations, common situational awareness among participating stakeholders is expected to be achieved. The message format, S-211, being part of the IMO common maritime data structure, has been developed based upon earlier experiences in Port of Limassol, together with eight other European ports, as part of validating the PortCDM concept.

RISE in the STEAM Project

The RISE contribution to the STEAM project is mainly advisory, helping to ensure that the STEAM project adopts the latest experiences of introducing PortCDM in port environments and the connectivity to external stakeholders that comes with that. For RISE, the STEAM project is an important demonstration of how PortCDM can be applied in operational settings.

Building upon its independence and scientific foundations, RISE provides advisory, research, and analysis services to the various maritime actors such as shipping companies, transport operators, and ports to help them upgrade their capabilities for data sharing and collaboration by following international standards together with its insight on contemporary developments related to the optimization of the port call processes. Examples of such services include:

- The orchestration of pilot implementations
- Advising on technical implementations
- Independent analysis and evaluation
- Development and demonstration-in-real-life tools for digital collaboration and data sharing
- Provision of a Living Lab approach for enhanced collaboration within the maritime transportation business and operational ecosystem
- Development and refinement of concepts for ecosystem innovation
- Dissemination of concepts and experienced effect coming out of enhanced data sharing and collaboration

The STEAM project is now working on implementing PortCDM. RISE is contributing by communicating its established experience of both the PortCDM concept and its implementation. The further experience gained by RISE in the STEAM project will, in turn, then be available to assist others around the world that wish to implement PortCDM.

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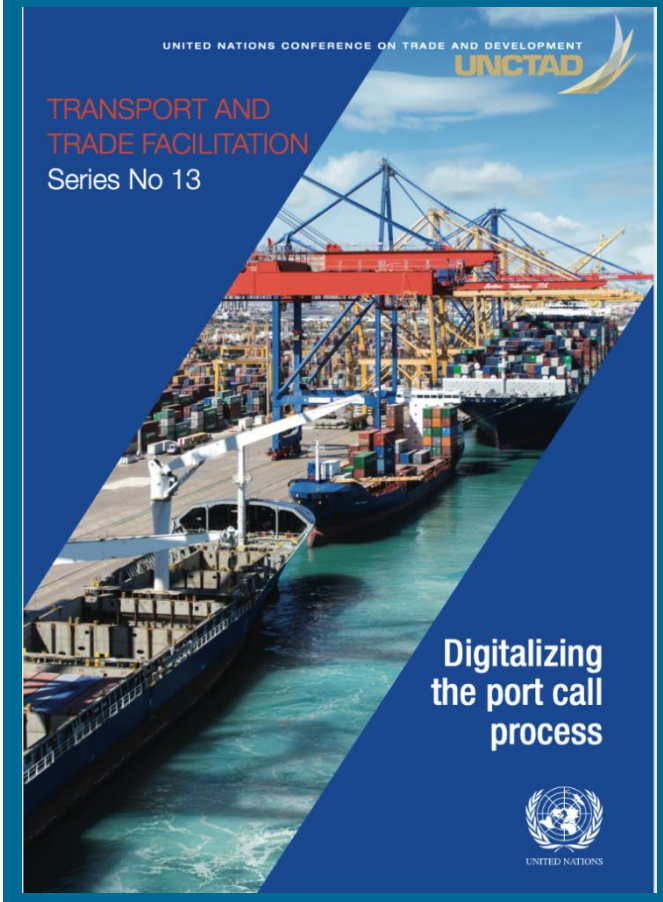
“RISE is contributing by communicating its established experience of both the PortCDM concept and its implementation”



https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=2663

Cyprus Ports Authority: The Role of the VTS

Mr. Stelios Kolomvos, an experienced VTS operator, in his own words said: "The STEAM project is moving towards the right direction and funding for employing first-line personnel that will operate the STM/STEAM systems should be pursued more aggressively. STEAM is all about synchronizing the various actors, making processes more efficient and reducing delays. If ship owners can save money after the processes are optimized via the port call system deployment, then that would translate into more jobs in the maritime industry, reduced overhead costs in the commerce industry, thus benefits to the whole of society."

The role of the Cyprus Ports Authority (CPA) has changed significantly after the privatization process in 2017. It is now the regulating and monitoring authority and it is no longer involved in the operations process. The Limassol VTS (Vessel Traffic Services) has remained a part of CPA and its responsibilities are now more important than ever. The Limassol VTS has 3 pillars of responsibility, namely, safety of navigation, safety of human life, and environmental issues. The key challenges faced by the VTS are the following: (i) the language barrier when communicating with ship captains since many of them are of Asian/Eastern European origin and their English aptitude skills are limited; and (ii) the workload of the VTS is currently too much and the department is understaffed, with only three persons currently covering the 24-hour shifts.

Limassol VTS has no responsibility for any other port in Cyprus (Larnaca, Vasiliko, etc.). The VTS stations for the respective ports unfortunately remain unmanned; therefore, it is up to the shipping agents to report vessel operational times. Limassol VTS is the only manned VTS station in Cyprus at the moment. Nevertheless, in the coming days, three more operators are expected to join the team and the Larnaca port area will most likely be managed by the Limassol VTS station as well.

An important undertaking of the STEAM project is to establish the Limassol Shore Center. The shore center will offer a number of maritime services to assist ships navigating the area and improve navigation conditions. Such services may include recommendations of specific times of arrival in order for the ship not to face delays at the port, suggested routes to avoid possible risks or congestion in the area, and others.

Stelios Kolomvos believes that the Limassol Shore Center will add significant value to the Cyprus Maritime Industry. However, due to the limited resources in terms of personnel faced by the VTS right now, it would be a challenge to undertake additional duties for managing the Limassol Shore Center.

A solution to tackle this would be to charge a small fee for offering the services in order to cover the cost of additional personnel or incentivizing the existing personnel. After all, if value is added and money is saved, then there is no question about it.

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Cyprus Shipping Association

In the last year (2019), CSA continued its constructive and effective role providing its services to the port operators of Limassol and Larnaca ports, including its services in the sector of the handling of goods onboard the vessels (stevedoring sector). In addition, its services covered the passenger and cruise sectors, the transhipment cargo, as well as the oil and gas activities in Cyprus ports.

CSA was also focused on the preparation of a strategic scheme concerning the improvement of the way that the Port of Limassol as a result of its privatization could serve the vessels, cargoes, and passengers on international accepted models and levels globally. CSA has been also dealing with the possible privatization of the Port of Larnaca, aiming to secure that the commercial sector of the port will continue to be served after the privatization and that the port costs will not be affected.

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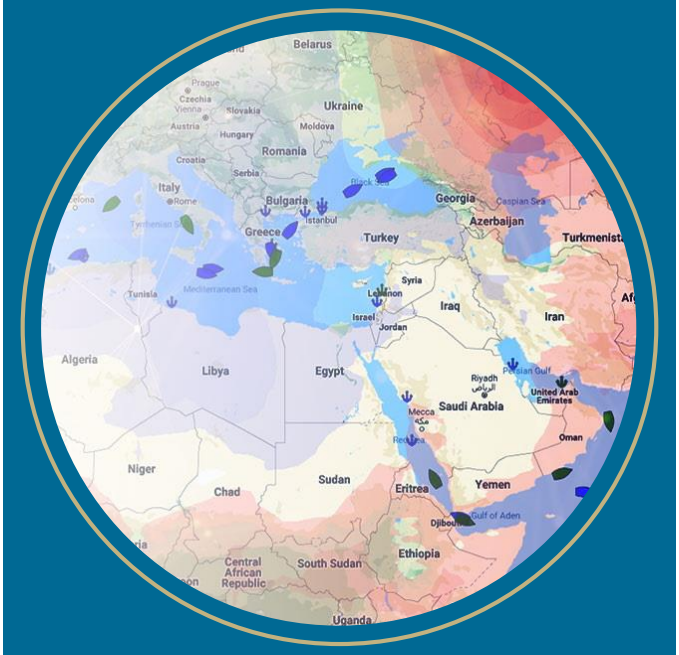
"CSA assures all colleagues that it will continue contributing positively and trying its best concerning the accomplishment of the aims and goals of our STEAM project"

Furthermore, CSA has been in closed contact with the competent Ministry concerning the construction of the new industrial port at Vassiliko for serving mainly the oil and gas sector as well at certain types of bulk cargoes (imports and exports). In addition, CSA spared no effort and time trying its best with the collaboration of the port operators to improve the marine services provided to vessels keeping also the costs as low as possible at the Port of Limassol. CSA also continued participating in the functions of FONASBA, ECASBA, ICHCA, BIMCO, and other international port, shipping, and maritime fora, with a view to raise awareness of the international developments in these fields of activities playing also a vital role as a result of its huge experience in this regard. Last but not least, CSA assures all colleagues that it will continue contributing positively and trying its best concerning the accomplishment of the aims and goals of our STEAM project.



Totoheo Maritime

Totoheo Maritime specializes in innovative, efficient, and functional solutions in the fields of digitalization, satellite and radio communication, as well as automation and navigation systems. Headquarters are located in Cyprus with an office in Greece and partner offices in Dubai and Singapore. The experience of Totoheo Maritime in the maritime sector in combination with its dynamic approach towards innovative technologies, such a full digital solutions for the Maritime Industry, e.g., the Digital Control Room (DCR), provide a unique advantage for the STEAM project.

Totoheo Maritime operates in a connected dynamic and sustainable maritime sector, supported by reliable and efficient connectivity and innovative technologies – all underpinned by the Totoheo values. Totoheo Maritime's participation in the STEAM project aspires to achieve reliable and efficient connectivity by installing a number of AIS stations around the entire coast of Cyprus, thus monitoring and consuming information for analysis to achieve effective, safe, secure, and environmentally-friendly maritime traffic.

Further, having in mind that the way port visits are performed today cause unnecessary emissions due to underutilization of the world merchant fleet and port infrastructures, Totoheo Maritime will try to alleviate the problem within the STEAM project by improving and widening the spectrum of situational awareness during a specific Port Call by employing the power of MarineFields' data sharing platform, PERSEUS, and the dynamics arriving from its Digital Control Room in relation to precise estimation of vessel time of arrivals and departures.

MarineFields is an impartial company that was established in February 2017 in Limassol. It is manned by people with a long and established experience in the shipping industry, they are associate partners of the STM Validation Project, and have signed MoU agreements and collaboration contracts with global industry leaders, governments, and organizations. They are also participants of the International PortCDM Council. Their vision is to provide one interface for everyone to share timestamp data to each other; port actors to be connected to other port actors and for ports and port actors to be connected to outside actors (shipping companies and other ports).

Totoheo Maritime

"Totoheo Maritime is striving to achieve 'Just-In-Time' in ports"

As of today, it is common that when ships are visiting ports, they are not served 'Just-In-Time'; i.e., ships must wait until port resources are available. If ships and ports would be more synchronized that would mean that the ship could steam in a more optimal way, requiring less energy and in effect reducing its carbon footprint.

The same goes for port actors that could serve their clients in 'Just-In-Time' reducing waiting times for service providers and increase the utilization of available infrastructure and resources.

The information from the AIS stations mentioned above will also be available to the PERSEUS platform pushing the boundaries of data sharing to new levels. The overall port call data sharing concept is captured in the diagram below.

In conclusion, Totoheo Maritime is striving to achieve 'Just-In-Time' in ports, through a collaboration environment engaging those that are involved in sea transport and drive away from the traditional sharing of information, which is done in isolation of other ports or the ship itself.

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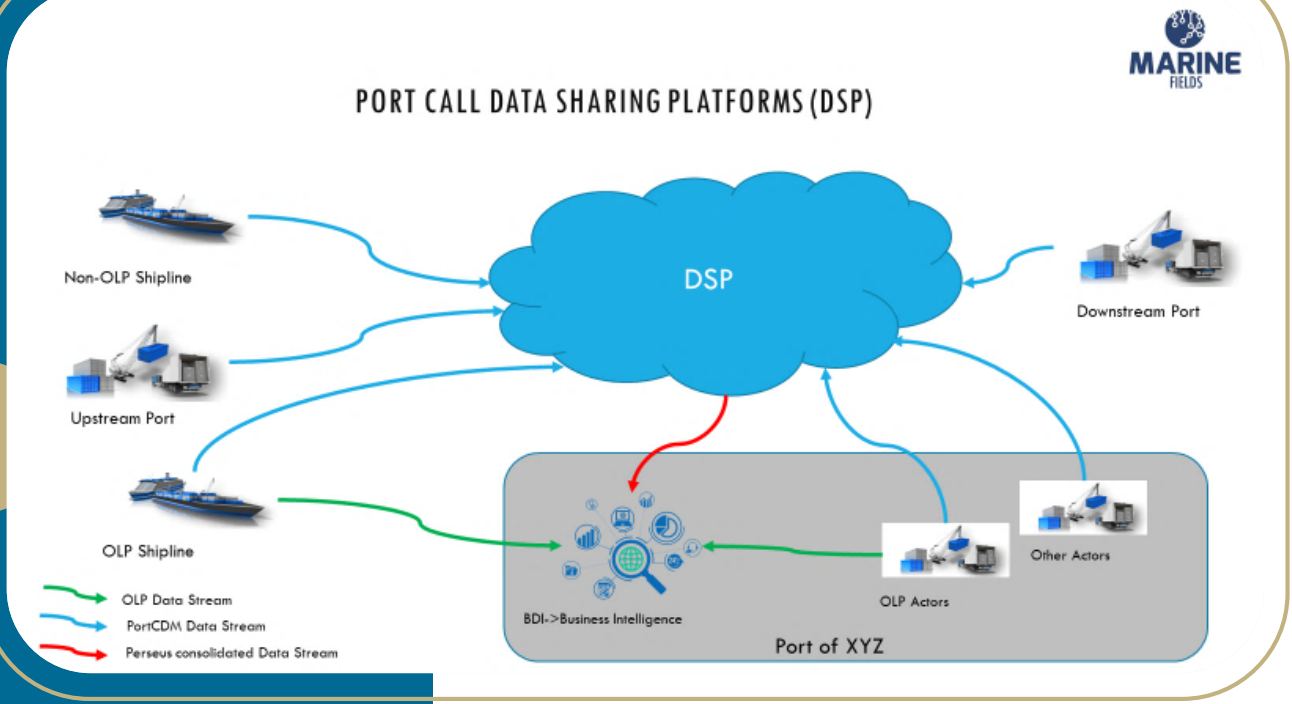
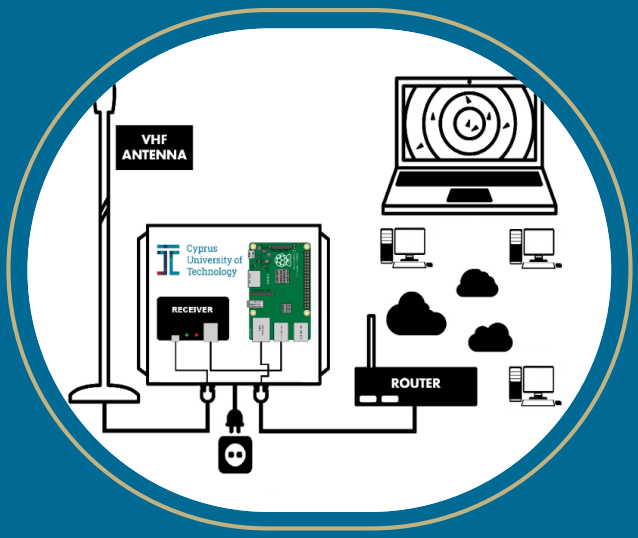


Ship Tracking Intelligence Platform



Current architecture of receiving AIS data

STEAM's Ship Tracking Intelligence Platform is a web-based platform that exploits Automatic Identification System (AIS) data signals to provide meaningful representations, graphs, and data analytics to the end user. AIS is an automatic tracking/signaling system used by ships to provide their continuous position throughout the seas. Signals are sent in constant time intervals containing encoded information regarding a ship's attributes at the given time the signal was sent. These attributes include position coordinates in latitude and longitude, speed over ground, course over ground, the vessel's unique identification number (MMSI), and many more. AIS messages are discriminated into categories depending on the message type they concern, with the number of total types of messages summing up to 27. The main categories of AIS data messages our platform utilizes and handles are the following. First, the Position Report A concerns Class A vessels, denoting commercial ships. Second, Position Report B concerns Class B vessels, which are smaller ships like fishing boats and leisure crafts. Third, we have the Base Station Report containing messages that are sent from AIS service stations to coordinate themselves. Finally, Static Voyage Data offer additional information regarding Class A vessels such as destination and expected time of arrival.

Currently, the platform provides data from a single source, which is installed in the premises of Cyprus University of Technology. There is a VHF antenna that collects the AIS data, forwards it to a receiver, and then to a Raspberry Pi to decode the actual messages. From then, the messages are organized and stored into a database containing valuable information. Finally, the platform's front end connects with the database to access the stored data and provide important statistics and visualizations.

Our immediate plans for extending the platform include the integration of other sources and streams of AIS data. One such source is provided by the Cyprus Shipping Deputy Ministry and contains the AIS data currently consumed by the VTS station at the Port of Limassol. We are also closely collaborating with Tototheo Maritime for the installations of more AIS data stations so that we can increase the coverage of the received vessel signals. Installations will be applied at various locations, including Paralimni, Agia Napa, Larnaca, Zygi, Paphos, and Latchi. These locations ensure significant geographical coverage across Cyprus.

Paralimni station

Agia Napa station

Larnaca station

Zygi station

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Shipping Agents' Interviews: Opinions, Issues, & Challenges

Many services are offered by the shipping agents in Cyprus. A major service is organizing and coordinating a vessel's port call, acting on behalf of the vessel's owner or charterer. Other services include arranging the ship's paperwork and certificates, bunkering, machinery and equipment provisions (spare parts), ship-to-ship transfer services, provision of fresh water, ship chandlery, freight forwarding, customs clearance, logistics, on the spot monitoring of operations, cargo inspection, land transportation of imports, cargo warehousing and storage, clearing formalities, securing cargo for the line or ship operator, crew changes, transfers, and welfare.

According to shipping agents, the most common destination ports of vessels leaving the Port of Limassol are Beirut, Haifa, Alexandria, Ashdod, Piraeus, Thessaloniki, etc. Their shipping lines' vessels call in various major ports such as Rotterdham, Antwerp, Valencia, Ravenna, Genoa, Venice, Mersin, Barcelona, Marseille, Liverpool, Castellon, Dublin, etc.

Shipping agents face many problems related to the port call process in the Port of Limassol. Most shipping agents mention the difficulty of accurately predicting estimated time of arrivals (ETAs) for ships coming from nearby ports such as Haifa or Beirut. Furthermore, there are communication and coordination problems because some actors do not update the PCS on-time.

"PCS software is not used by all parties creating inefficiencies in the port call process"

A ship may be delayed due to late customs' clearance. Also, VTS typically notifies the shipping agents late for expired certificates prior to ship's arrival. ETA is often affected by the previous port the ship is coming. If the previous port is nearby the Port of Limassol. registration is done 24-12 hours before arrival, whereas if the port is not close to Cyprus, registration is done 2 days before arrival. In comparison, ETD is not an issue for the shipping agents who usually register it 2-4 hours before departure. In addition to the aforementioned problems, communication and cooperation with the port operators are considered disrupted and fragmented according to the shipping agents' views. There are cases where parties are not properly informed causing to skip a ship with priority entering the port. PCS software is not used by all parties creating inefficiencies in the port call process.

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Cyprus Subsea Consulting & Services Ltd

Cyprus Subsea Consulting & Services Ltd (CSCS) was founded in December of 2012 in Nicosia, Cyprus. The company blends academic and technical expertise as well as seagoing and survey experience to carry out research, commercial, and governmental projects in the Eastern Mediterranean Sea, Middle East, Europe, and North America. CSCS serves the public and private sector with oceanographic consultancy, services, and equipment for offshore activities.

Specifically, Cyprus Subsea provides:

- traditional and autonomous survey expertise,
- knowledge of local oceanography,
- autonomous surface and underwater vehicle operational capabilities,
- high-tech equipment for marine monitoring and communication through a global supplier network,
- real-time data collection including planning, execution and analysis with a mix of platforms that spans the surface to full ocean depth, and
- simulations of ocean sound speed, temperature, salinity, currents, oil spills or trajectories, forecast and re-analysis.

Cyprus Subsea provides rentals and official resales as an Authorized Distributor of marine and maritime products of manufacturers at the forefront of scientific exploration, underwater robotics, through-water wireless communication networks, underwater navigation, satellite technology, and the cutting-edge of fluorescence-based optics.

CSCS also specializes in marine robotics and autonomous systems, such as gliders, AUVs, ROVs, surface drifters, moorings and landers as well as operational forecasting and observing systems. In addition to specializing in state of the art marine systems, CSCS develops custom products and systems for user-specific needs, such as the SMART Cable, DeepEcho Module, and gListen Board.

Contributions to STEAM: The variety of activities carried out in and around ports may cause the deterioration of air and marine water quality. Reducing port pollution is a top priority for many governments; however, it can incur significant cost and is often politically challenging. The first step is to determine the levels, types, and sources of pollution through regular monitoring and assessment of major ports, which incorporates monitoring of air and marine water quality along with the collection of online meteorological and oceanographic data.

Cyprus Subsea Consulting & Services Ltd

> **"The network will autonomously monitor water and air quality within and around the port and relay them to the users through easily accessed online media"**

CSCS lends its expertise to the development of efficient port management tools and innovative monitoring and forecasting systems to aid in the improvement of port operations and reduce the risk and environmental impact of maritime accidents. For the purposes of the STEAM project, CSCS is contributing to the strategic designing and installation of an environmental monitoring network for the Port of Limassol. Following a state of the art study and a stakeholder consultation survey, CSCS identified the core needs to monitor specific parameters and deliver data in real-time. The network will autonomously monitor water and air quality within and around the port and relay them to the users through easily accessed online media. The presence of oil in the sea, oceanographic and meteorological parameters including wave height and direction, sea current speed and direction, sea surface temperature and salinity, and water quality will be monitored. Air monitoring observatories will provide information on the presence of particulate matter in the atmosphere, air temperature, humidity, pressure, CO, NO_2, SO_2, and O_3 concentrations. The network will be built using innovative technological advancements and set a precedent for port monitoring networks in the region.

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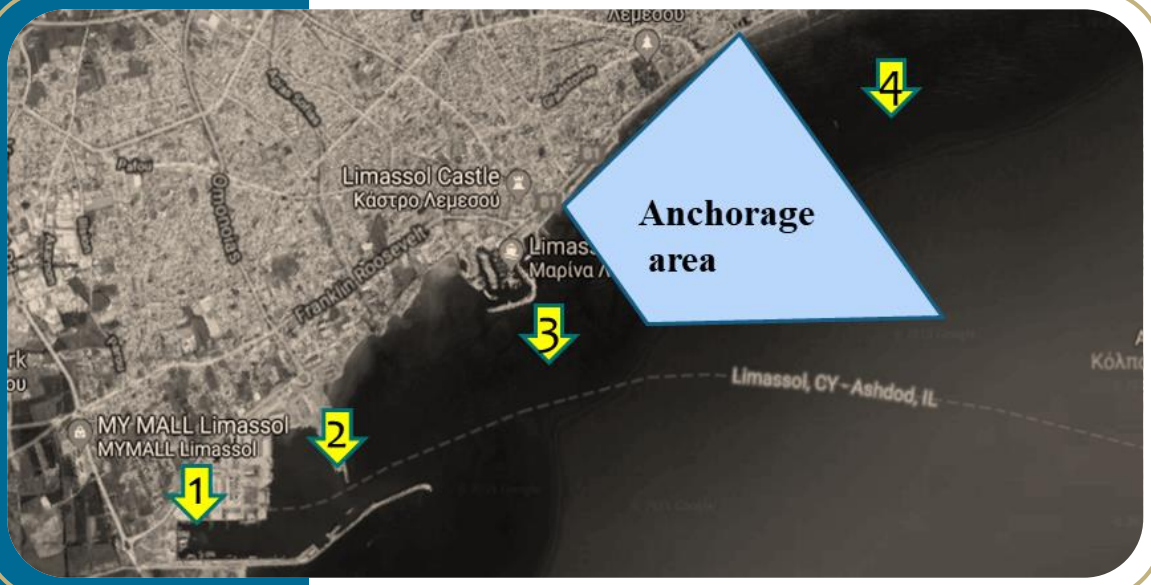

CSCS has designed an integrated monitoring service for the port of Limassol that includes the installation of two oil sensors within the port (locations 1 and 2) and two environmental buoys in the coastal area of Limassol (locations 3 and 4).

"Delevant is primarily responsible for tasks related to data cleaning, integration, and analytics"

Delevant Business Solutions Ltd

Delevant is a firm specializing in Supply Chain Planning (SCP) and Corporate Performance Management (CPM) software solutions and technology-based professional services. It has a team of highly qualified professionals and a network of associate consultants. It was founded by Aris Televantos in 2008 and it delivers solutions and technology-based services to its global clients either directly or through its partner network.

Delevant utilizes mathematical modelling and machine learning on top of the business intelligence platform to support better and quick business decisions. Furthermore, it also performs Financial Budgeting and Sales and Operations Planning; where Sales Forecasting, Operations Planning, Operations Scheduling, and Inventory Planning are considered its key tasks.

In the STEAM project, Delevant is primarily responsible for tasks related to data cleaning, integration, and analytics. Its key objectives are twofold: (i) to integrate and store all available data providing a single unified view of the data; and (ii) to develop new methods, tools, and algorithms for implementing a variety of analytical techniques (such as statistical machine learning, text search, and signal processing) for extracting new meaningful insights. Before performing its data analytics tasks, it is responsible for cleaning dirty data. For example, the AIS data contain the vessel's destination, which is manually entered by a captain, leading to several inconsistent or dirty data (e.g., Limmassol, CY LMS, LimaSSol Cyprus, LMSCY, etc.). Delevant needs to clean and resolve these fields to the correct destination port. To do so, Delevant has developed a fuzzy matching algorithm that receives dirty destinations and returns the clean port names based on the similarities generated by the algorithm. As a result, the developed fuzzy matching algorithm has successfully cleaned over 2 million dirty records to date with a 92.6% success rate.

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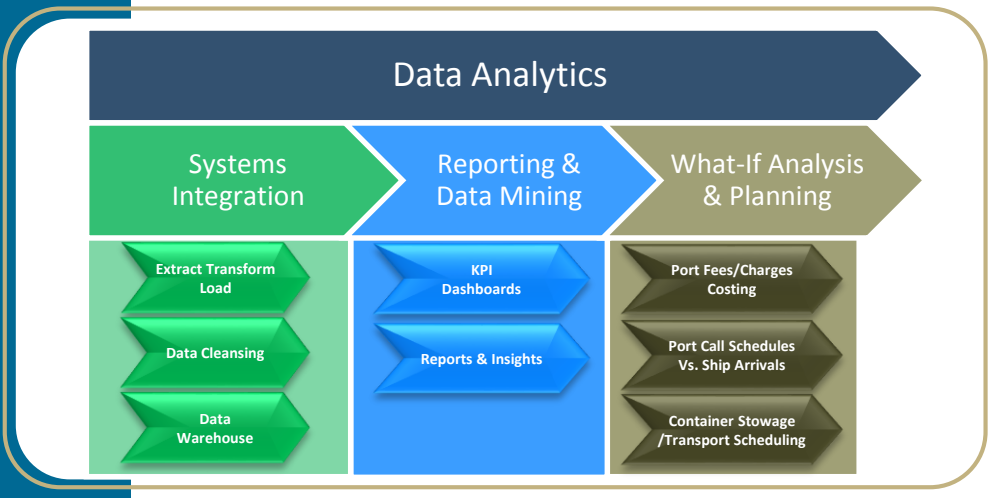

Kickoff Meeting

Living Lab Meeting

STEAM Vision & Objectives

STEAM (Sea Traffic Management in the Eastern Mediterranean) is a three-year project that has started in Jan. 2019 with a budget of approximately one million EUR. The primary goal of STEAM is to develop the Port of Limassol to become a world-class transshipment and information hub adopting modern digital technologies brought to the maritime sector, as well as a driver for short sea shipping in the Eastern Mediterranean.

Towards this end, the ports of Cyprus, and especially the Port of Limassol will have a vital role to play due to its strategic location, as an information hub, exchanging information with both nearby ports and ships in the Eastern Mediterranean area for optimizing the ships' routes, expanding the planning horizon for port operations, and avoiding possible dangers. The geographical location of Cyprus encourages the use of Cyprus ports as transshipment hubs for short sea shipping.

In the STEAM project, the implementation of the STM concept will be significantly extended and enhanced by the successful testbed conducted at the Port of Limassol through the further development of Port CDM, which will enable real-time situation awareness to all participants involved in maritime activities in the ports of Cyprus. Moreover, the Port of Limassol will be modernized with innovative technological solutions and advanced data analytics providing new decision-support tools and services for maritime stakeholders.

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Associated Stakeholders Network

DP WORLD Limassol
EUROGATE Container Terminal Limassol
P&O Maritime
Maritime Institute of Eastern Mediterranean
CSC Cyprus Shipping Chamber Navigates Cyprus Worldwide