

## Maturity Levels 3 to 5 in implementing PortCDM - increasing data sharing and situational awareness

by<sup>1</sup>

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### On behalf of the International PortCDM Council

#### Introduction

Port Collaborative Decision Making (PortCDM) is a concept to support those engaged in or associated with port call operations. It aims to improve efficiency and effectiveness of activities in any port by providing a framework for data sharing and enhanced collaboration. The PortCDM maturity model shown in Figure 1 sets out the incremental steps required to successfully establish PortCDM as part of a port's operations and identifies the capabilities required at each level.

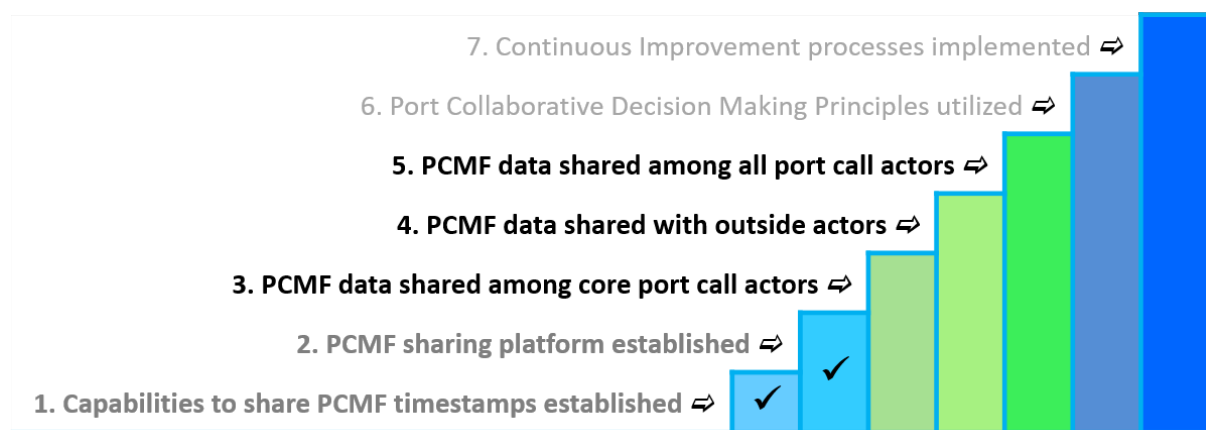


Figure 1: PortCDM maturity scale focussing on Levels 3 to 5

Building upon the previously published concept note on PortCDM maturity levels,<sup>2</sup> two implementation notes of the International PortCDM Council have been published: one on how to achieve compliance in collaboration and data sharing with PortCDM,<sup>3</sup> and another providing guidance on Levels 1 and 2. This implementation note provides practical advice on how to continue the PortCDM maturity journey through Levels 3, 4 and 5, as highlighted in Figure 1.

Our note is based on the practical experience gained in implementing and validating PortCDM in the ports

<sup>1</sup> Participating authors are all belonging to organizations that are participants in the International PortCDM Council (IPCDMC)

<sup>2</sup> Lind M., Andersen T., Bergmann M., Watson R.T., Haraldson S., Karlsson M., Michaelides M., Gimenez J., Ward R., Andersen N-B., Gonzales A., Holmgren B., Zerem A., Rauer F., Sahlberg H., Lindberg J. (2018) The maturity level framework for PortCDM, Concept Note #13, STM Validation Project

<sup>3</sup> Lind M., Bergmann M., Andersen T., Haraldson S., Ward R., Andersen N-B., Michaelides M., Watson R.T., Ferrus Clari G., Zerem A., Rylander R., Gimenez J., Karlsson M. (2019) Achieving compliance in collaboration and data sharing with PortCDM, Implementation note #1, International PortCDM Council (IPCDMC)

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of Barcelona, Brofjorden, Gothenburg, Limassol, Sagunto, Stavanger, Valencia, Umeå, and Vaasa. These implementations were part of the recently completed PortCDM testbed activity, which was part of the wider STM validation project.

Having introduced digital capabilities<sup>4</sup> for sharing Port Call Message Format (PCMF) timestamps in Maturity Level 1, and established a data sharing environment in Level 2, the next three levels deal with increasing the participation and data sharing of port call actors, and in this way increasing situational awareness among all participants. At Level 3, PCMF data is shared among the core actors at the port. At Level 4 the reach of PCMF data is extended to actors outside the port including ships, other ports and hinterland operators. Finally, at Level 5, PCMF data is used by all relevant port actors, thus achieving true common situational awareness for the total eco-system of a particular port. In the following, we shall discuss the implementation of each of these three levels, which provide the basis for the overall enhanced efficiency of port call operations and upon which the higher maturity Levels 6 and 7, dealing with collaborative decision making and continuous improvement respectively, can be established.

A list of the most important timestamps to be reported and shared using the PCMF is shown in the table in Annex A.

### Level 3: PCMF data shared among core port call actors

On Level 1, all the core port call actors have acquired the capability to share PCMF time stamp data using the S-211 data exchange standard. On Level 2, some of those actors have established a PCMF data sharing platform. Based upon these two capabilities, it is then possible to move to Level 3 of the maturity model.

Level 3 is focussed on how to enhance the uptake and adoption of the principle of sharing time stamps between the core actors using the PCMF data in real time.

A port might have many different actors playing different roles in the port call process. Actors in the port call, like the master on a ship, the ship operator, the ship agent, the terminal, and the port authorities are clearly core actors in a port call. However, there are likely to be others that are willing to share time stamps in real-time in order to facilitate decision making and operations, and thus they should also be included in Level 3. This group of actors are critical to the ongoing success at the higher levels of PortCDM maturity because their activity at Level 3 creates the basis and the example for others to also start sharing data.

The decision on who constitutes a vital port call actor that needs to be included in Level 3 depends on the characteristics of the particular port. However, it is important to try to reach all those that would be in possession of basic time stamp information that might impact others in their planning. In this context, so-called *primary process actors* are defined as those from whom others would be seeking information about the timing or progress of port call events.

Having too large a group may make it difficult to obtain consensus. On the other hand, having only a few actors involved may hamper later adoption by leaving out somebody important. An unnecessarily small group may also result in reduced data quality since essential pieces of data might be missing for creating an accurate situational awareness picture. The main criteria for deciding whom to include is that the group should include all the actors necessary to ensure the provision of the information needed to support

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<sup>4</sup> As elaborated in Lind M., Haraldson S., Bergmann M., Ward R., Andersen N-B., Andersen T., Michaelides M., Karlsson M., Watson R.T., Zerem A., Olsson E., Gimenez J. (2019) First Steps in implementing PortCDM - establishing the data sharing environment, Implementation note #2, International PortCDM Council (IPCDMC)

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informed decision making in all the important stages of the port call process both in terms of actuals and estimates.

Experience from the PortCDM testbeds in the STM validation project confirmed the requirement to include information about a ship during the four most important stages of the port call process:<sup>5</sup> (i) arrival at traffic area, (ii) arrival at berth, (iii) departure from berth, and (iv) departure from traffic area. Accordingly, as a minimum, eight timestamps for each port call are required to be shared: four Actual Times (AT) and four Estimated Times (ET). It follows that all the actors who can provide this information should be automatically classified as core actors and their participation would be required in order to reach Level 3. For example, for the port of Limassol core actors according to this definition are the Ship (AIS), the ship agents, the VTS operators, the two terminal operators Eurogate and DP World Limassol, and also P&O Maritime who handles pilotage, towage and linesmen operations for all incoming and outgoing traffic. The timestamps reported from these actors for the four states as shown in Table 1.

State / Timestamp	Estimated time (ET)	Actual time (AT)
Arrival at traffic area	Ship agents, P&O Maritime	VTS, P&O Maritime, AIS
Arrival at berth	P&O Maritime, Eurogate, DP World Limassol	P&O Maritime, Eurogate, DP World Limassol, AIS
Departure from berth	P&O Maritime, Eurogate, DP World Limassol	P&O Maritime, Eurogate, DP World Limassol, AIS
Departure from traffic area	Ship agents, P&O Maritime	VTS, P&O Maritime, AIS

Table 1: Example of actors responsible for real time reporting of time stamps at the Port of Limassol

Note that there could be more than one actor providing a specific timestamp, for example the AT of arrival at berth could be provided by pilots, terminal operators and from automatic detection using AIS. In such a case, it would be preferable to have the participation of all of them as core actors, as one of the basic underlying principles of PortCDM is that there should be multiple sources of information wherever possible in order to enhance the validity of the timestamp. When different actors report different times for the same event this can be the signal for the relevant actors to seek to clarify that particular report and in the process improve its reliability. This type of coordination is a key part of the collaboration that is introduced at Levels 6 and 7. However, even at Levels 3 to 5, the sharing of all available timestamps contributes to improving the quality and reliability of the data thereby increasing confidence in the common situational awareness picture. In situations when this is difficult to achieve at first, it is sufficient for Level 3 to include at least one actor providing each specific timestamp. The participation of others can be re-visited when moving to Level 5.

At this stage, it is important to determine and to differentiate between *data owners* and *data producers*. This is because the data owner is the one that will actually allow their data to be shared. The data producer is primarily responsible for the quality of the data. For example, the ship's master is responsible for the quality of the ship's ETA, but it is the ship's operator that owns the ship's ETA information. When a third party (for example, ship agents) shares the ETA of a ship, the following should be required: permission to share, statement of the time and the source of the ship's ETA.

<sup>5</sup> Lind M., Bergmann M., Haraldson S., Watson R.T., Park J., Gimenez J., Andersen T. (2018) Creating a mature data sharing regime - Thriving in the connected ecosystem, Concept Note #4, STM Validation Project (<https://www.ipcdmc.org/galerie>)

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Experience from the validation of PortCDM showed the benefit of having a project group or development team, which is responsible for making sure that all the core actors actually participate. In our previous implementation note on building up Level 1 and Level 2 capabilities, we proposed the *Living Lab* methodology as a way of engaging all those involved. The work in the project group requires the appointment of a chair for the group, who should be selected as acting on behalf of the community of port actors and typically representing one of the most influential core actors. Preferably, it should be somebody, who is deeply interested in the competitiveness of the particular port, and who is able to inspire the other core actors to conform.

One of the first activities of the project group will be to analyse all the events on their metro map, spreadsheet or similar presentation created as part of Level 2 activity. The purpose of this is to identify the actors who are likely to be the first ones to know about the various timestamps for a ship, both the Estimated and the Actual time stamps. This could be set out as shown in Table 1, in order to obtain clarity on who could be responsible for first reporting the data and contributing with updates to the original time stamps.

#### Level 4: PCMF data shared with outside actors

Having reached Level 3 on the maturity scale, there is now an effective sharing in real time of timestamps among the core actors in the port regarding the arrival and departure of a ship. Based on this, it is possible for all those actors at any point in time to obtain a basic situational awareness as the basis for their decision-making. Evidence from validating PortCDM has shown that this substantially contributes to the overall efficiency of a port, especially with regard to optimising the planning of operations and resources.

However, just increasing awareness and optimising ships' timing in and out of a port (including off-loading and loading) among the core actors is not enough. The activities for handling cargo/passengers also needs to be coordinated with the hinterland services. This is particularly important for the cargo. Think of the loss for a container with flowers, if it has to wait several days for quarantine inspections. Think of the loss on a container with components for a just-in-time production line, if the trucking agency cannot be informed promptly when the container is ready for pick-up? Or think of the loss if festival goods arrive after celebration activities have finished due to a lack of coordination with the hinterland supply chain?

As we can see from these examples, it is necessary to augment the optimization efforts of the port with those of the different supply chains, where the maritime transport and the port activities are an integrated part. This is the basis for moving to Level 4 on the PortCDM maturity scale.

At Level 4, the PortCDM activities are extended outside the port to ships, other ports and hinterland operators. A prerequisite for reaching this level is that the interested outside actors must establish the necessary technical capabilities for exchanging PCMF data with the port. At the same time, an agreement has to be reached among the participants – old and new (perhaps as part of the on-going Living Labs or other consultative process) about what data will be exposed and by whom. For example, in port-2-port communication the relevant data to be exchanged with a downstream port would be ET and AT of departure from the current port and ET of arrival in the next port. The actor responsible for providing and updating this information at both ports would be the one required to contribute this information to the sharing platform. In a port-2-ship communication example, information, such as ETA from the ship and estimated discharge/loading times from the port, could be exchanged between the ship's captain or an operational centre and the port actors responsible for handling the specific port call on the other end. The data sharing platform established in reaching PortCDM maturity Level 2 would cater for all relevant actors receiving this

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information in real-time. These actors could include ship agent, VTS operator, terminal operator, pilot, tugboat and linesmen.

Since, at Level 4, data will be exposed to a wider community, it is important to respect all privacy concerns of the local port call actors. Even though PortCDM deals mainly with timestamp information - which seems to be non-sensitive, experience from the validation testbeds confirmed that some actors could be concerned about sharing information with nearby terminals and ports, especially if they consider that their data could be used to evaluate and compare performance against competitors.

During the validation of PortCDM as part of the STM validation project, most terminals were happy to share timestamps, such as the estimated and actual times of arrival and departure to and from a berth. However, some terminals expressed specific concerns about sharing timestamps for cargo operations commenced and cargo operations completed. It is common that the terminal operator is only able to predict the estimated time of the completion of the cargo operations, rather than the estimated time of a ship's departure. The reason for this is that various other activities sometimes beyond the control or visibility of the terminal operator take place once the cargo operations are completed. These include a draft survey, ship's preparation for departure, obtaining ship's clearance, etc. With this in mind, some of the terminal operators in the PortCDM testbed expressed that the timestamps for cargo operations could be connected directly or indirectly to key performance indicators (such as berth productivity, time for serving a vessel, waiting times, number of vessels/containers served per hour-day, ship turnaround time, etc.). They felt that if such information reached a ship-owner, then ships might opt to use another nearby port terminal, where they expected that the service could be faster. Similarly, other agencies /agents could have concerns on sharing timestamps and other data related to their ships due to privacy and competition reasons. Given those experiences, and the recommended approach, it is essential that all organizations involved jointly develop a position of what is necessary to share in order to enhance the planning capabilities of everybody.

In order to deal with these concerns, appropriate privacy rules need to be in place so that data is only shared with the actors who have a legitimate claim to be informed. The PortCDM doctrine states specifically that the data owner / contributor will decide who has access to their data. For example, sensitive data concerning cargo operations should only be shared internally among the local port call actors, while other non-sensitive data could be shared with everybody involved. Nevertheless, it is important to emphasize here that the basic principle of PortCDM relies on data sharing in order to achieve common situational awareness, so these restrictions should only be made if deemed absolutely necessary.

The experiences for the STM validation project were quite positive, and even those actors that expressed concerns about sharing certain timestamps were nevertheless still actively involved in the process of validating PortCDM and establishing a connector to their system for sharing data. Accordingly, we believe that it is possible to eliminate scepticism and reluctance to share certain timestamps through continuous discussion, interaction and exchange of views with other actors involved in the process. This is one of the most important reasons for having the Living Labs process in place. Through the Living Labs and the actors' continuous involvement in the process, it becomes possible to persuade them to share more data, when they see that mutual benefits can be obtained.

As an example, moving to Level 4 is particularly important for the Port of Limassol in reaching its goal of becoming a transshipment hub and enhancing short sea shipping operations in the Eastern Mediterranean area. To help achieve this and to improve port call efficiency, the local port call actors expressed their strong desire to establish port-2-port communications with other neighbouring ports in the area. Given the

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geographical position of Cyprus, nearby ports are very close. For instance, the Port of Haifa is only 8 hours away for most ships. This typically makes existing types of communication (such as reports from the shipping agents) insufficient for planning purposes.

Given the short distances from previous ports, a big challenge for Limassol port stakeholders is when late changes to a vessel's schedule requires them to reschedule the port arrangements. Extending PortCDM data sharing to cover all the parties involved in port calls among the Middle Eastern ports helps to avoid such problems by providing improved and up-to-date situational awareness and improved port-to-port collaboration for all involved. A more stable and reliable basis for communication for all actors involved in the port call process means that everyone involved has access to the same information for planning purposes.

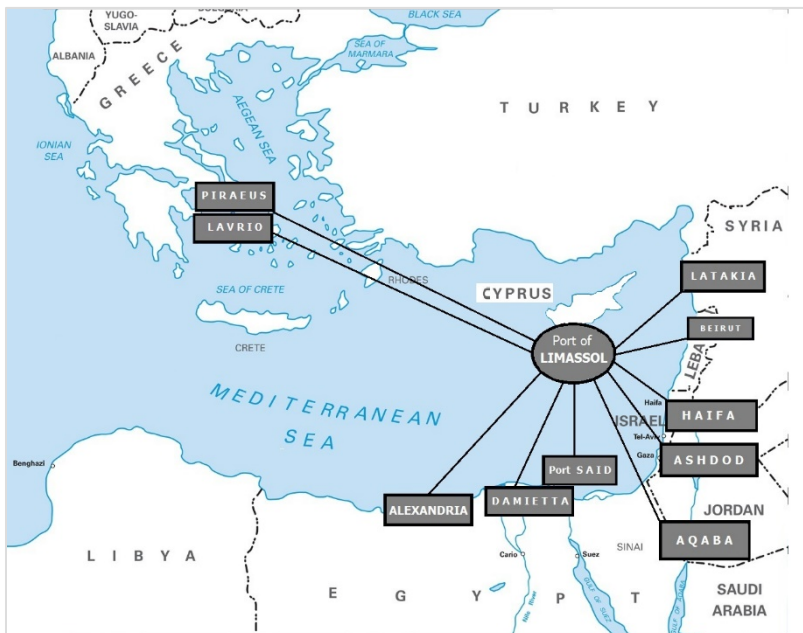


Figure 2: Most frequent routes of ships arriving and leaving from Port of Limassol

#### Level 5: PCMF data shared among all port call actors

At Level 5, participation in PortCDM is extended to ALL port call actors involved in the port call process. This leads to true common situational awareness, as detailed information about events and intentions for all the different stages of the port call process are now made available in real-time using a common sharing platform. This essentially provides the foundation for the more advanced Levels 6 and 7 that deal with collaborative decision making and continuous improvement respectively. These will be detailed in the next implementation notes.

Depending on circumstances, maturity Level 5 can be pursued incrementally on a sector by sector basis in a segmented approach, as was described in implementation note 1.<sup>6</sup> This segmented approach allows more flexibility in implementing PortCDM and advancement to the higher maturity levels, especially in situations covering larger ports with many terminals and different types of traffic, for example ports serving both cruise ships, container traffic and dry cargo.

In order to meet maturity Level 5, the critical timestamps shown in Annex A should be shared in real-time by the actors that are in possession of and have the permission to share the specific timestamps. This could mean that several actors could share the same timestamps since they might all be in possession of them. This has dual benefits, on the one hand establishing common situational awareness using the collective

<sup>6</sup> Lind M., Bergmann M., Andersen T., Haraldson S., Ward R., Andersen N-B., Michaelides M., Watson R.T., Ferrus Clari G., Zerem A., Rylander R., Gimenez J., Karlsson M. (2019) Achieving compliance in collaboration and data sharing with PortCDM, Implementation note #1, International PortCDM Council (IPCDMC)



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knowledge of the port call actors, and on the other hand revealing any deviations between the different port actors with respect to the timestamps that they may be using for planning purposes.

### Summary of actors and data elements to be included

Building upon the actor segmentation described in concept note #18<sup>7</sup> together with the desirable set of states to be shared,<sup>8</sup> the following table sets out the progression of data sharing requirements for each of the PortCDM maturity Levels 3 to 5.

Level	Data element to be shared	Actors to be included	Consumers
3	Estimated/actual time of arrival / departure to/from port area/berth	At least primary process actors (terminal and port operators including port authority if they exist)	Actors belonging to the community of port actors engaged in the PortCDM collaboration and data sharing
4	<p><u>For ship operators:</u> Estimated/actual time of arrival / departure to/from port area / berth</p> <p><u>For upstream (previous) ports:</u> Estimated/actual time of departure from port area / berth</p> <p><u>For downstream (next) ports:</u> Estimated time of arrival to port area / berth</p> <p><u>For hinterland operators:</u> Estimated/actual time of arrival/departure to/from port area/terminal</p>	Ship operators, hinterland operators, and upstream and downstream ports	The same as Level 3 complemented with upstream ports, downstream ports, ship operators, and hinterland operators
5	Data associated with critical timestamps (see Annex A) from all actors that use one or several of those timestamps in their coordination and synchronization activities	<p>Secondary process actors (such as service providers such as tug operators and moorers), and</p> <p>Tertiary process actors (such as regulatory, husbandry agents, bunker providers, etc.)</p>	The same as Level 4 complemented with additional participating port actors

On each of the levels, it is crucial that at least a majority of the actors in the port, or the chosen segment, are engaged in collaboration and data sharing. This means for example on Level 4 that the upstream ports, the most frequently used shipping lines, and the most frequently used hinterland operators should be connected.<sup>9</sup>

It is also important to mention that the choice of the specific actors to be included on each level is determined by the situation. For example, in the event that a terminal operator in the port, or in the chosen segment, is not yet prepared to share data, it may be that other actors, possibly secondary and/or tertiary process actors, can be identified, which might be in possession of the desired data elements. If data are supplied by them, it could be a step towards motivating previously reluctant terminal operators to

<sup>7</sup> See Lind M., Lane A., Bjørn-Andersen N., Ward R., Michaelides M., Sancricca M., Watson R.T., Bergmann M., Haraldson S., Andersen S., Park J., Theodossiou S. (2018) Ships and Port Idle Time: Who are the Culprits?, Concept Note #18, STM Validation Project (<https://www.ipcdmc.org/galerie>) which distinguishes primary, secondary, and tertiary process actors

<sup>8</sup> Lind M., Bergmann M., Haraldson S., Watson R.T., Park J., Gimenez J., Andersen T. (2018) Creating a mature data sharing regime - Thriving in the connected ecosystem, Concept Note #4, STM Validation Project (<https://www.ipcdmc.org/galerie>)

<sup>9</sup> Since PortCDM has emerged from being port call centric, it is however important to establish capabilities for sharing data between the port and hinterland operators, in order to secure that the port becomes an efficient intermediary in the transport chain end-to-end.

participate when they see that useful data is being shared between the engaged community of port actors.

### Increasing participation and data sharing: The Living Labs approach

Levels 3 to 5 are all about increasing the number of actors joining the PortCDM community and sharing data using the PCMF. This participation has both technical and operational dimensions. The technical dimension means establishing a data sharing platform and building connectors for exchanging data with this platform<sup>10</sup>. The operational dimension includes what data to share, who owns it, and how to motivate new actors to join and start sharing data. Our PortCDM validation experience has shown that building a port community based on trust and collaboration is best achieved through continuous interaction and live discussions between the port actors. The Living Labs process, as described in the previous implementation note, can play an important role in achieving this result.

The Living Labs approach was implemented in the PortCDM validation testbeds and was very successful in bringing the actors together and fostering the open, information sharing environment upon which PortCDM depends. The results presented in the PortCDM Validation Report clearly indicated the successful creation of a collaborative culture within the ports of the various testbeds through the Living Labs process.



Figure 3: Living Labs are all about interaction and discussion - not lectures

The PortCDM Validation Report states that all the actors participating in the Living Labs were satisfied with the meetings. 70% of them stated that through the Living Labs, they started talking to some port actors for the first time. 40% started to collaborate with the newfound actors, of which 67% stated that the new collaboration enhanced their own operations. All believed that the Living Labs contributed positively towards port collaboration and that it was beneficial to hear views and understand the situation from the perspective of the other actors. A particularly positive outcome was that all the participants supported the concept of the sharing of information through the Living Labs process, enabling them to improve their ways of solving problems. Through the discussion and the exchange of opinions, many questions were answered. Furthermore, participants were very positive that everyone was allowed to freely express their opinions. A majority of the respondents confirmed that this situation enabled a better understanding of the role of other actors in the port call process. As a result, everybody had a broader understanding of the full port call process

<sup>10</sup> As elaborated in Lind M., Haraldson S., Bergmann M., Ward R., Andersen N-B., Andersen T., Michaelides M., Karlsson M., Watson R.T., Zerem A., Olsson E., Gimenez J. (2019) First Steps in implementing PortCDM - establishing the data sharing environment, Implementation note #2, International PortCDM Council (IPCDMC)



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and all actors had a better appreciation of how information in the hands of other actors would be of value for them individually and for the port in general. It is at the very heart of the PortCDM concept to develop a collaborative culture within the port, and the Living Labs process the STM Validation project demonstrated very convincingly the value of creating and maintaining such a culture.

The conduct of Living Labs should vary slightly at each maturity Level 3 to 5 in order to be most effective.

At Level 3, we need the participation of the core actors. In this situation, the Living Labs can serve as the place for inviting those actors to come and listen to the benefits of joining the PortCDM community in their port. The procedure for joining, including detailed information on building a connector to the system for exchanging PCMF should be clearly explained to them during these sessions. Incentives for providing data should be provided and any privacy concerns should be clearly addressed.

At Level 4, the reach is extended to actors outside the port. Here, the Living Labs have the important role of establishing the rules for this information exchange. Among the things that need to be discussed between the core port actors are: (i) What information do we need to obtain from the outside actors? (ii) What information can we provide to the outside actors? (iii) Who will be responsible for providing this information?

At Level 5, the aim is to have the participation of all actors. Here, the Living Labs can serve as the place for inviting the additional actors which have not yet joined. They should be invited to come and listen to the benefits of joining the PortCDM community and the easy steps for becoming engaged. In this situation, emphasis should be given to providing concrete examples from the current PortCDM implementation and success stories to further motivate their enrolment.

**The value of situational awareness**

The three levels (Levels 3 to 5) of PortCDM maturity described in this note are concerned with encouraging actors within the port and outside the port to share data between each other in real-time. This data sharing has a two-fold purpose: 1) to ensure that the different port call actors are aligned, meaning that they have the same conception of progress and plans for when different events are expected to happen, and 2) to enable a common situational awareness among the participating actors. It is of particular importance to stress the value of achieving a common situational awareness and access to reliable information by all actors. These were the core benefits identified by participating actors in the PortCDM testbeds of the STM validation project.

**Sharing data and benefits among the actors**

In order to reach enhanced coordination and synchronization among involved port call actors, it is necessary to share data about plans, progress and disruptions. In this respect, two lessons have been confirmed repeatedly. First, the port cannot be regarded in isolation and needs connectivity to the upstream chain. Second, it is essential that the port as such has capabilities to communicate to the wider maritime supply chain community about its capabilities and what may be expected by the downstream chain from the conglomerate of actors that constitute a port.

To engage in enhanced data sharing also means that benefits need to be shared among all relevant participants. The time when a particular port call actor can capitalize by withholding basic planning data is over. There are simply too many reasons why benefits from data sharing need to be distributed over all

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organizations engaged in port call operations. If all actors cannot see themselves as benefitting, their participation is not very likely, and they will resist passively or actively. The result is a loss for the port in general, and when the cake gets smaller, it is likely that the original slices enjoyed by each actor will get smaller, too. Other ports are likely to be more competitive, and the benefit and reputation of all those involved will suffer.

**More information**

Guidelines and advice on general PortCDM concepts are available at IPCDMC<sup>11</sup>. This note has been elaborating specifically on the PortCDM maturity Levels 3, 4 and 5. Other PortCDM maturity levels will be elaborated on in further implementation notes.

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*PortCDM brings sea transports to become an integrated part of the global transport chain by providing means for ports to enhance their capabilities in collaboration and data sharing. The International PortCDM Council (IPCDMC) is an independent association with global reach providing international standards and guidelines for regional and local implementations of PortCDM.*

Detailed information on various aspects of the PortCDM concept can be found in the series of previously published concept notes posted at [www.stmvalidation.eu](http://www.stmvalidation.eu) and/or [www.ipcdmc.org](http://www.ipcdmc.org).

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<sup>11</sup> <https://www.ipcdmc.org/>

## ANNEX A

### CRITICAL TIMESTAMPS<sup>12,13</sup>

ET Arrival_Vessel_TrafficArea	AT Arrival_Vessel_TrafficArea
ET Anchoring_Commenced	AT Anchoring_Commenced
ET Anchoring_Completed	AT Anchoring_Completed
	AT Arrival_Pilot_Vessel
ET Pilotage_Commenced	AT Pilotage_Commenced
ET Pilotage_Completed	AT Pilotage_Completed
	AT Departure_Pilot_Vessel
	AT Arrival_Tug_Vessel
ET Towage_Commenced	AT Towage_Commenced
ET Towage_Completed	AT Towage_Completed
	AT Departure_Tug_Vessel
ET MooringOp_Commenced	AT MooringOp_Commenced
ET MooringOp_Completed	AT MooringOp_Completed
ET Arrival_Vessel_Berth	AT Arrival_Vessel_Berth
ET CargoOp_Commenced	AT CargoOp_Commenced
ET CargoOp_Completed	AT CargoOp_Completed
ET UnmooringOp_Commenced	AT UnmooringOp_Commenced
ET UnmooringOp_Completed	AT UnmooringOp_Completed
ET Departure_Vessel_Berth	AT Departure_Vessel_Berth
ET Departure_Vessel_TrafficArea	AT Departure_Vessel_TrafficArea

AT = Actual Time, ET = Estimated Time (as to be continually updated in due course by the actors that provide such timestamps)

<sup>12</sup> When reporting an ET or AT, there will be requirements in terms of anticipation of the estimation, accuracy, etc. which will be defined elsewhere

<sup>13</sup> This list of time stamps is based on the desire to capture critical events pursued in the port call process. It is however important to assure that the used time stamps are also agreed upon by the involved community of port actors participating in PortCDM. As to be taken into consideration are e.g. that different time stamps are relevant for different types of trade, that ships for particular port calls might not be needing pilotage and towage, and that some ships perform operations while being at anchor and not visiting the berth.