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(Concept note #9)

## **Towards Unified Port Communications - from a project format to a global standard**

by

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### **Introduction**

Nearly every business is concerned with reducing costs and increasing efficiency, and the logistics chain is often point of attention. As a result, procedures, standards and tools, have been developed to enable just-in-time logistics, to reduce expensive delays, and eliminate idle process steps. To achieve these goals, the arrival of needed goods must be accurate. In the car industry, for example, suppliers are tightly integrated into the supply chain, so their parts arrive exactly when needed to avoid cost for holding stock and avoid disruption in the production process. As shipping is a critical supply chain component, companies expect its delivery times to be precise.

For shipping, just-in-time is most critical when approaching ports and during port operations<sup>1</sup>. The various actors need to synchronize their processes to ensure the different necessary services are provided when they are needed. The fact that shipping contracts include accepted and agreed waiting times is a clear indication that coordination between the actors is not working well, hence contracts foresee the possibility that just-in-time is not achieved, and certain delays are expected and tolerated. In a competitive transport environment this is no longer acceptable for many customers who understand that reliability in the Supply Chain cuts costs.

Some studies indicate that there is the potential to decrease the total time of a port call by as much as 25%. Faster port turn-around times will enable higher utilization of ships and of a port's infrastructure.

Higher reliability can only be achieved if necessary data are exchanged between actors. In shipping, the number of players involved in any given port call, as well as the international structure of shipping, requires standardisation of data exchange on an international level. As such the MONALISA and the STM<sup>2</sup> Validation projects have developed a Port Call Message Format (PCMF). The ongoing STM

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<sup>1</sup> Lind M., Rygh T., Bergmann M., Watson R.T., Haraldson S., Andersen T. (2018) Balancing just-in-time operations – coordinating value creation, STM Validation project

<sup>2</sup> Sea Traffic Management



project is validating the use of PCMF to make sure that it meets its intended purpose and provides the expected gains.

The article elaborates and explains the collaboration, coordination and compatibility of PCMF as it is being transformed into an S-211 format, which further enhances interoperability with other aspects and activities essential for efficient shipping.

### The components of a port call message

The port call process covers the different states that need to be achieved during a port visit. A state represents the different operations that are core to the port call. State changes need to be shared among involved actors for coordinating and evaluating overall a port call’s progress and for planning future operations. Example states include: a vessel’s arrival to the port area, piloting, towage, mooring operations, cargo operations, cruise passenger excursions, bunkering, and departure from berth.

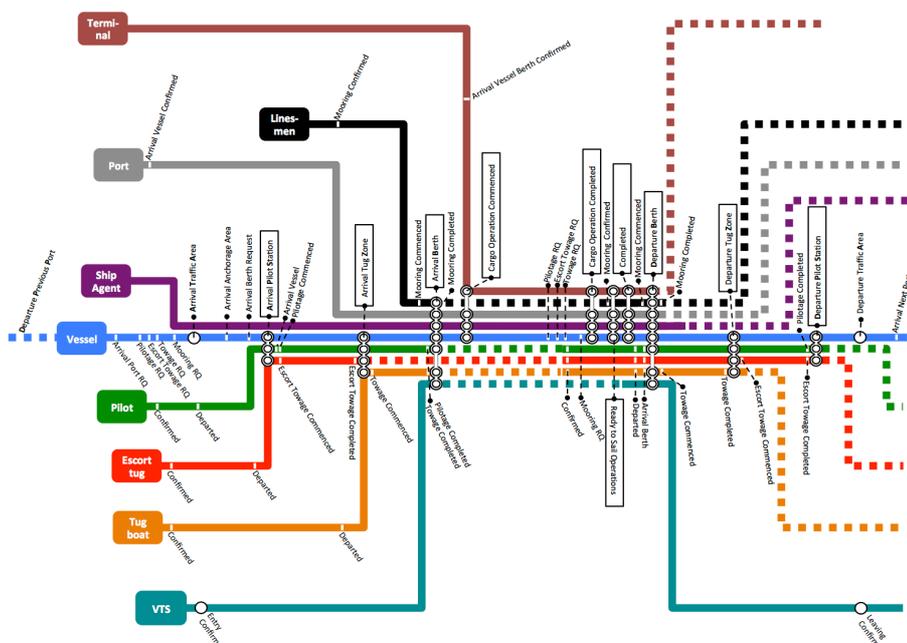


Figure 1: States in the port call process

A metro map (Figure 1<sup>3</sup>) is a metaphor for illustrating the complexity of coordinating a port call in a distributed setting, showing the need for collaboration between multiple actors in staging a port call. In the figure, each metro line represents an actor and each metro station represents a state important for the coordination of a port call. The metaphor illustrates a flow of states for coordinating a port call, from the arrival of a vessel (left part of figure 1) to its departure (right part of figure 1).

By including states related to departure from the previous port and arrival at the next port, we facilitate port-to-port collaboration.<sup>4</sup>

A state is concerned with the time a physical object should arrive at, or departs, from a particular geographical spot (*location state*), such as the vessel is securely at berth (“all fast”), and the certain time a particular service is to be commenced or completed (*service state*), such as cargo operations

<sup>3</sup> Lind M., Haraldson S., Karlsson M., Watson R.T. (2016) Overcoming the inability to predict - a PortCDM future, 10th IHMA Congress – Global Port & Marine Operations, 30th May – 2nd May 2016, Vancouver, Canada

<sup>4</sup> Lind M., Bergmann M., Haraldson S., Watson R.T., Michaelides M., Herodotou H., Voskardies S. (2018) Port-2-Port Communication Enabling Short Sea Shipping: Cyprus and the Eastern Mediterranean, STM Validation project

are commenced. Commencing and completing a service is normally preceded by a sequence of communicative acts, such combinations of request, request received, request denied, request confirmed, and request cancelled (*administrative state*) regarding a service state. Each type of state thus refers to a location or a location change (when a movement is concerned) and a time sequence (see figure 2).

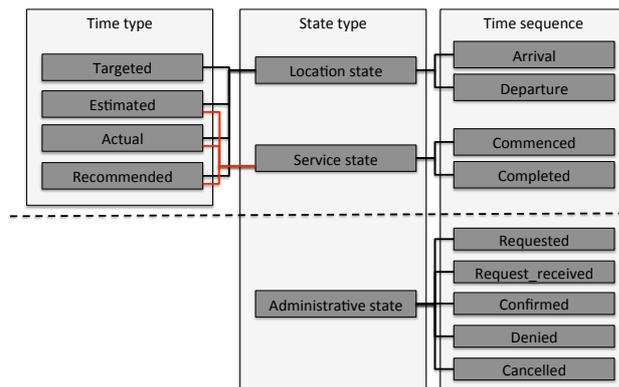


Figure 2: Overview of time stamp composition and its relation to time sequences for different time types

There is a need to enable the planning horizons and support downstream actors to be updated about the latest progress and disruptions of a port visits, as well as enabling upstream actors to adjust their plans according to downstream capabilities. Sharing intentions and progress is core to the Sea Traffic Management concept. For this reason, each message related to a state is concerned with a particular time type (communicative function). Four types of time types are identified; the time when a particular state is *targeted* to occur as well as the *estimated* occurrence, when the *actual* state occurred, and when a particular state is *recommended* to occur.

The port call message format is built upon three state types, where two of those (location states and service states) can be combined with a time type (see figure 2). Each state type comes with a time sequence and should express at which location or between which locations the service or movement refers. A time stamp of an administrative state is not combined with a time type since all administrative states are actuals. Since the format itself is flexible on which reference objects (such as vessel, pilot, tug boat etc.) as well as which service objects (such as e.g. berth visit, pilotage, cargo operations etc.) this allows each port to utilize the time stamps they need for sharing data among the stakeholders. Possible combinations of reference objects, service objects, and locations constitute a state catalogue that in combination with the time type defines the set of time stamps that a particular port could adopt. This means that the port call message format does not build upon a fixed set of time stamps; rather it provides a structure to expand the repertoire of time stamps dependent on context and situation. For example, time stamps related to ice breaking are applicable to just a few ports.

Since the port call message format also encapsulates possibilities to express the agreement process, port call messages can share data related to the subjective as well as the objective world.<sup>5</sup>

<sup>5</sup> Dietz JLG (1999) Understanding and Modelling Business Processes with DEMO, Proc. 18th International Conference on Conceptual Modeling (ER'99), Paris

## The scope of the port call message format – different application areas

### The case of Port Collaborative Decision Making (PortCDM) within STM

One of the sources for developing the foundations of the Port Call Message format is the need identified and addressed by STM. PortCDM is a key enabler of STM, comes out of the MONALISA and STM Validation projects and covers the following port aspects:

- Deriving situational awareness from multiple sources of time stamp data to create a holistic view
- Collaboration (expressed as when to share data and what to share (as described by the Metro Map))
- Associating time stamps from different data sources with the same port call as well as voyage identifiers
- Access management and data ownership (within the port and between the port and external actors)
- A unified format for port call messages (the port call message format, i.e. S-211)
- A set of globally defined KPI's (duration time, waiting times/anchoring times, punctuality, predictability, berth productivity, and capacity utilization)<sup>6</sup>
- A system of indicators and warnings enabling port call actors to coordinate actions and manage disruptions (conflicting data, unreasonable relationships, missing data)
- A governance structure on global, regional, and local (port) level:
  - Global: As little definitions as possible and as much as necessary
  - Regional: Building on a global governance structure and further defining common ground and agreements within a region (e.g. adapting to regional legal conditions)
  - Local: Full implementation as needed locally, compliant with the Global and Regional settings

Because port call coordination both covers internal (intra-port) and external (port call synchronization towards other actors (such as other ports, ships, and hinterland operators)) coordination<sup>7</sup> there is a need for unified communication so each actor uses a standardized message for communicating time stamps.

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<sup>6</sup> Lind M., Haraldson S. (2016) New KPIs will show how ports become more efficient with PortCDM, STM Validation project

<sup>7</sup> Lind M., Bergmann M., Haraldson S., Watson R.T., Park J., Gimenez J., Andersen T. (2018) Port Collaborative Decision Making (PortCDM): An enabler for Port Call Optimization empowered by international harmonization, STM Validation Project

### The case of functional definitions for nautical port call information

Recently UKHO and IHMA published promising work<sup>8</sup> on functional definitions on port data for the purpose of aligning different standards for harmonization of port call data. The capabilities of the port call message format to carry event data shows that the functional definitions related to time stamp data and the port call message format are in full alignment.<sup>9</sup> Such alignment also enhances the precision of the format as well as being internationally aligned with internationally agreed definitions

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### **Alignment with other standards**

Work has also been initiated to ensure compatibility between the port call message format and the GS1 and ISO EPCIS and associated CBV standards (ISO/IEC 19987 and 19998) for services related to both port call operations and logistics, building upon combinations of data streams associated with port call operations and goods movements. The orientation of this work is as follows:

- The existing EPCIS standard is explicitly targeted at the exchange of actual timestamps. To also include future timestamps (estimated, recommended and planned) in the EPCIS environment (as part of the who, what, why, when dimensions of the EPCIS messages) is still a subject of investigation.
- An international task force is to be established in which alignment is secured to port and vessel data related to both intentions and actual outcomes carried by other standards. In this work, it is estimated that the IMO-number as an already internationally approved standard would possibly be included in the EPCIS format in the short-term.
- All parties involved agree that EPCIS and the common maritime data structure (the CMDS concept) will need to be aligned and fully interoperable.

This has also brought forward the need for internationally agreed universal identifiers. For this purpose, two different levels of IDs necessary to operate smoothly machine-2-machine are acknowledged:

1. IDs on a conceptual, entity definition level
2. IDs on a reality object level

The first level uniquely defines an object based on its attributes. This is handled within the IHO GI registry on various granularities (e.g., the entity “Ship” with all its attributes and sub-entities is defined as required). With the migration of the port call message format towards CMDS (S-211), this level of IDs as part of the definition process will be established.

The second level is identifying a unique instance of a conceptually defined entity (e.g., identifying a specific ship with its characteristics using the data definitions as registered in the CMDS). The port call message format builds upon various existing standards and utilizes definitions already

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<sup>8</sup> UKHO, IHMA (2017) Functional Definitions for Nautical Port Information

<sup>9</sup> Lind M., Bergmann M. (2018) Functional Definitions of Port Call Message – The Ability of the Port Call Message Format to address functional definitions for nautical port call information, STM Validation project

established, like Maritime Resource Naming standard (MRN), or XML ID Syntax (gml:ids). Within the STM Validation project, the use of a universal port call id as an MRN identifier has been validated with positive results.

Alignment and interoperability with Identification schemes already in use to unambiguously identify “reality objects” is an on-going priority. E.g. the “Functional Definitions for Nautical Port Information” mentioned above explicitly state that GS1 Global Local Numbers (GLN) should be used to identify facilities within ports.

In the process of migrating the port call message format to the IALA, the goal is to also include a set of essential core ID’s.

### **Towards adoption of the message format by international associations**

PCMF needs to be internationally used because shipping is global. There are already competent organizations in place in the global community for defining message standards and associated regulations, guidelines, identification schemes or conventions.

The PCMF, as being developed in the European projects, is in a draft form that meets the requirements on the IMO Common Maritime Data Structure (CMDS) as manifested in the agreed GI Registry. This draft has been forwarded and accepted by IALA, in fact IALA has already assigned the identifier S-211 as the name of the future IALA PCMF standard. It is expected to be further developed and adapted by IALA once the responsible commissions have agreed on the final version.

On the technical side IEC is informed that S-211 is in development and the expectation is that IEC will reference the S-211 standard in its technical documents once it is endorsed by IALA.

### **Final words**

There are very strong business cases for unified port communication.

- Ships voyaging from port to port want the same language when communicating with all ports
- Shipping companies and fleet operating centres want enhanced port connectivity to follow the progress of operations of their monitored fleet, prior to and during a port visit
- Shore centres desire to capture the progress in the port to provide proper advice to a monitored fleet
- Actors being present at multiple ports want to harmonize their communication to other actors
- Ports need to enhance their coordination ability by standardized communication with other ports related to ships that are steaming between them.
- Ports need a unified way of communicating with hinterland operators to enable efficient hinterland movements of goods in and out of the port.

Peter Drucker is remembered for stating that, “If you can’t measure it, how can you manage it?” What do we need to measure to manage a port call? Our research and review of future directions indicates that for all elements engaged in a port call, we need to know at any time where they are or will be in



18<sup>th</sup> of April 2018

(Concept note #9)

the immediate future. This spatial-temporal approach to measurement implies measuring where things are and where they will be within a specified time horizon, because a port call is about managing the path between the present and multiple futures. Bringing the port call message format to the maritime sector is an important step in better management of the shipping environment and achieving efficiency gains.

***For more information, contact:***

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