SYNCHRONIZATION FOR PORT EFFECTIVENESS

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While recent political events including a potential Trade War prompted by the US President have focussed attention on customs and tariffs, a report [1] to the World Economic Forum concluded that, 'there are far more significant impediments to trade than tariffs'.

The report indicated that 'reducing supply trade barriers could increase world GDP over six times more than removing all tariffs'.

The report went on to say that, 'reducing supply trade barriers to trade could increase GDP globally by nearly 5% and increase trade by 15%'.

Finally, it stated that '…improving border administration and transport and communication infra-structures …. even halfway to the world's best practices, would increase global GDP by USD 2.6 trillion or 4.7%. For comparison, completely eliminating tariffs would only increase global GDP by USD 0.4 trillion (0.7%)'.

A significant impediment to a more effective maritime transportation supply chain is the lack of relevant and up-to-date information for the effective planning and execution of all the activities involved in port calls.

In spite of the huge advances with containerization and the physical infrastructures in terminals, the lack of standardization, digitization, accuracy, availability and transparency in relation to accurate times for arrival, departure, and other vital information related to the timing and progress of events in a port call, continues to cause the inefficient use of resources and expensive delays.

Without accurate and timely Estimated Time of Arrival (ETA) and Estimated Time of Departure (ETD) and associated information about vessels, it is not possible to carry out effective planning of all a port call's activities.

This causes delays, underutilization of port resources, and the need for hinterland operators to allocate substantial time and resource buffers.

This is obviously expensive, and in many cases, these unavoidable buffers can be detrimental to the optimal delivery of the goods (for example, fruits, vegetables, livestock and other perishables).

While the internal IS and planning systems of each individual actor

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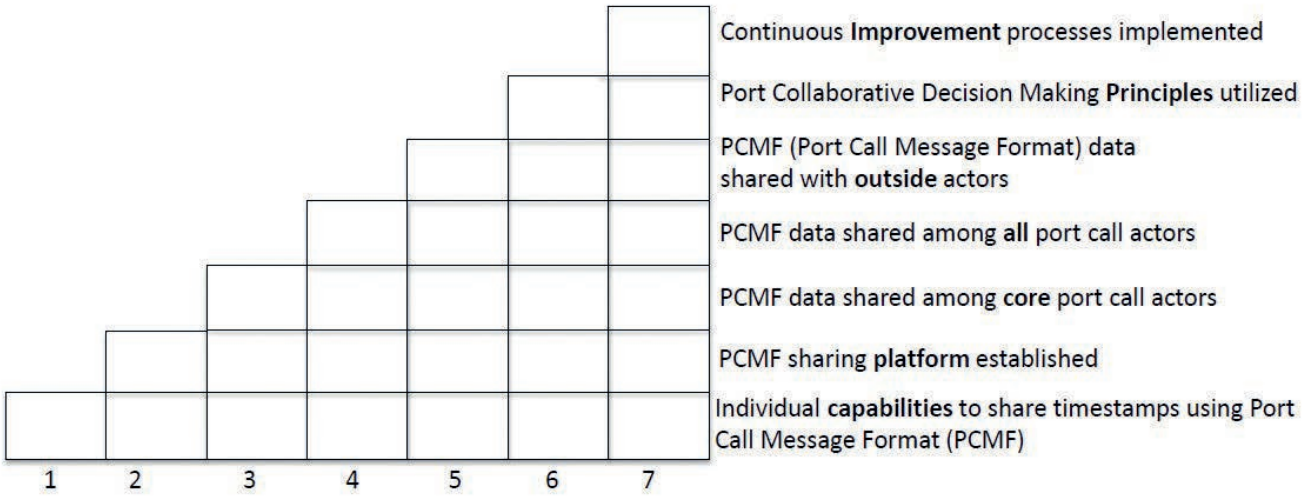

Figure 1: Maturity levels for Ports regarding capabilities for synchronization based on exchange of PCFM messages [4]

involved may provide for some local optimization, without appropriate data sharing, it is impossible to achieve overall optimization.

COORDINATION AND SYNCHRONIZATION

A port call often involves many significant actors and different service providers, sometimes 30 or more.

To be effective they must collaborate.

This happens through a substantial number of data exchanges, using all sorts of communication from advanced digital systems to SMS and phone.

Often, the shared data are non-standardised and out of date, and key actors are sometimes left out of the loop.

As a result, there is no common understanding of the situation, of progress, or of potential delays.

The Port Collaborative Decision Making (PortCDM) concept [2], part of the Sea Traffic Management (STM) Validation Project - a $49 million partly EU funded initative aimed at providing digital means for safer, efficient, and environmentally sustainable sea transports, is currently in its validation phase [3].

The main objective of PortCDM is to enhance coordination among port call actors such as ship agents, pilotage companies, port control, terminals, towage companies etc. By sharing their intentions and completions, both planned and actual, all contribute to a shared situational awareness and optimization of the port call.

It seeks to enable collaboration in the planning and subsequent execution of all the key activities by the diverse actors involved in a port call.

This includes data sharing, using the standardised exchange of key data in the form of timestamps, and messages indicating when events are planned or completed.

These standardized messages are updated and made available as and when there are significant changes that may affect other actors in the supply chain.

Within the STM Validation project, a translator, using the voyage information service (VIS) was demonstrated to facilitate the translation between the port call message format (S-211) and the route exchange format (RTZ).

PortCDM defines two levels of collaboration. The lower level identifies the coordination of activities to avoid major clashes in the activities of different actors and the more ambitions higher level of collaboration identified as synchronization.

This is where events occur seamlessly, just in time, and with little or no idle time for any of the actors involved.

Currently, port calls rely more on loose and often ad-hoc collaboration rather than on synchronization.

The biggest improvements in efficiency and effectiveness in ports happen when it is possible to synchronize all the major events in a port call, significantly reducing idle time.

A prerequisite for effective synchronization is an accurate and reliable exchange of information.

This can be achieved using the Port Call Message format (PCMF) based on the international S-211 standard.

IMPLEMENTATIONS

The STM Validation Project is now demonstrating its key principles in large-scale test beds in both the Nordic region and in the Mediterranean, encompassing around 300 vessels, 13 ports and five shore-based service centres as well as using the European Maritime Simulator Network.

STM messaging relies upon two message formats; the RTZ according to IEC 61174 Ed4, to be supplemented by IEC standard S-421, and the PCMF S-211 maintained by the International Association of Aids to Navigation and Lighthouse Authorities (IALA).

Both are fundamental elements in the standardised exchange of data (routes and time stamps) that lie at the heart of the STM concept.

Rotterdam is the largest container port in Europe, and on April 12, 2018, it started using STM arrival times to optimise port calls.

In the STM Validation Project up to 300 ships are planned to share their voyage plan schedules electronically, directly from their ECDIS/navigation system, with the participating port as well as with Port of Rotterdam.

Another success story is the Port of Stavanger, where different service providers are engaged for the first time in sharing data to enhance their planning capabilities.

In the Port of Limassol, where PortCDM promotes the port as a transshipment hub through connectivity with neighbouring ports, the ongoing validations are also giving promising results.

The latter three cases are enabled by the use of automatic connectors to the existing IS infrastructure used by the port's actors complemented with capabilities to manually provide timestamps.

In order to support the process of international harmonization and thereby secure long-term support for both users and providers, there is a need for a global governance structure for PortCDM.

For this purpose the international PortCDM Council has been established and comprises members of maritime associations, maritime authorities, and port authorities for the purpose of global governance of the PortCDM concept as well as providing recommendations for regional and local implementations.

LEVELS OF PORT DIGITIZATION

A port's ability to use the PCMF is a guide to classifying its digitization maturity level.

It is a useful way of assessing the extent to which a particular port can support collaboration.

There are seven maturity levels of port digitization (Figure 1):

As maturity levels advance, it indicates an increasing use of the PCMF standard to support both internal (local/organizational) and external (global/inter-organizational) port collaboration.

As a port ascends maturity levels, it becomes possible to expand planning horizons and to enable each actor to inform downstream actors about progress and possible disruptions using the standardized format for the exchange of relevant information about port call activities [5].

CONCLUSION

The results of the STM Validation project in general and the PortCDM implementations in particular, provide strong business cases for adopting unified port communication using the PCMF.

There seems no doubt that:

- Vessels want a common data exchange format so as to communicate with all relevant actors involved in a port call as required
- Shipping companies and fleet operating centres will benefit from enhanced data connectivity and message standardisation that enables them to better follow the progress of vessels, prior to and during a port call
- Port call actors will mutually benefit from sharing relevant information with other relevant actors
- Ports will enhance their coordination ability by using standardized data exchange with other ports in regarding ships that are steaming between them.
- Hinterland actors need to be included in the PortCDM data-sharing domain in order to enable efficient hinterland movements of goods in and out of the port.

If improvements in data sharing as described under the PortCDM concept are followed, and the ports involved move progressively up the digitization maturity scale towards synchronization of the port operations, then and a far more efficient and effective maritime transportation supply chain will ensue. This, in turn, will have a significant economic impact at all levels by addressing some of the issues raised at the 2013 World Economic Forum.

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Research Institutes of Sweden (RISE) (Viktoria) in Sweden is a non-profit research institute, part of RISE, enabling sustainable mobility by use of digital technologies. The aim is to contribute to a worldwide development that takes care of the great challenges for the automotive and transport sector organized in five application areas; Cooperative systems, Digitalization strategy, Electromobility, Sustainable business, and Sustainable Transports.

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