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Agenda item [[2]](#footnote-3) 6

Technical Domain / Task Number 2 …………………………………

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Concept Paper - System for Vessel Shore Reporting (MS8)

# Summary

## This paper proposes a system which aims to facilitate vessel to shore reporting, aligning with the objective as defined by IALA for Vessel Shore Reporting – to “Reduce the burden of submittal and distribution of required reports” and contributing to the development of Maritime Service 8.

## Mariners face various challenges when performing ship reporting:

## Ships are currently required to submit a report to the destination port prior to arrival. However, the procedures, reporting contents and formats vary from port to port. This may lead to confusion for ship masters.

## The reporting takes place over different communication platforms, leading to inefficiencies and possible miscommunication.

## Different reports have to be submitted to different parties, for various functions, e.g. crew and goods clearance, at different times, making the process more complex and time consuming.

## IALA has provided guidelines for the Vessel Shore Reporting Maritime Service (MS 8), which lists several requirements for a Vessel Shore Reporting system. This paper proposes a solution which addresses the following requirements listed in the guidelines:

## Allow shipboard and shore-based personnel to submit, generate and distribute required reports

## Retrieve information from shore-based sources

## Alert user on which reports need to be submitted and to whom

## Fulfil the exact requirements of participating shore-based authority

## Generation of reports in the proper time period automatically

## Authorization by master before submission

## This proposed solution comprises 5 main components – the Central Repository, the Authentication/Authorization service provider, the Shipboard Reporting System, the Shore Client and the Shore Server.

## The solution allows Port Authorities to define the reports required from ships calling at the Port, and when these reports are to be submitted. Ships can retrieve the required report template for their destination port from the Central Repository, fill in the necessary information and submit to the destination port. Where possible, frequently requested information is already pre-completed in the report.

## The ship will submit an initial set of reports, based on the rules defined by the port authority of concern, in order to initiate a port call to the destination port. This initial submission can be performed by any user – the ship master, agent, owner etc. Upon successful submission of these reports to the destination port, the ship will be assigned a Port Call ID by the destination Port Authority. As the ship travels toward the destination port, the ship may be required to submit more reports.

## Other technical considerations that this solution will need to consider but not covered in depth in this paper include security, authentication and authorization as well as integration to IOT. These topics should be reviewed in future so as to better meet the needs of mariners.

## Purpose of the document

This paper describes a proposed system for vessel shore reporting for the Committee’s consideration.

# Background

The objective of Vessel Shore Reporting, as defined in the IALA Guidelines on MSPs, is “to reduce the burden of submittal and distribution of required reports”. This paper discusses the issues faced by mariners when preparing and submitting reports, and proposes a practical framework aiming to alleviate these issues.

## Current Ship Reporting Procedures

The ship reporting requirements and procedures for vessels calling at a port differ from port to port, but in general each ship is required to submit report(s) in advance to the Authorities at the destination ports. These reports include declared information required by the Authorities such as the Port Authority, Immigration, Port Health, etc. for the purpose of clearing the vessel to enter the port.

## Current Ship Reporting – Challenges faced by mariners

### Different types of Communication Platforms

Ship reporting currently takes place over different communication platforms using texts/files on emails, facsimiles, and voice communication that are transmitted through different means such as internet, radios and satellite communication. The use of such diverse means for ship reporting results in inefficiencies and increases administrative burden both on board and ashore. As there is no standard communication platform for exchange of information between ships and shore, ships masters and agents are expected to know the reporting procedures and requirements of the destination port obtained from published information.

### Lack of standardized reporting format

The reports used by the ports currently are not standardized, and each port has its own reporting format. This might confuse ship master who needs to understand the reporting format of different countries, and possibly result in different interpretation of the information to be provided.

### Multiple parties involved

Ship master might need to submit multiple reports when approaching a port, and these reports may need to be submitted to different parties/authorities. This makes the process of report submission more complicated, burdensome and time consuming.

## Requirements

The document “MARITIME SERVICES DESCRIPTIONS IN THE CONTEXT OF E-NAVIGATION” [1] provided a summary of the operation approach for Vessel Shore Reporting system:

“Electronic systems for ship reporting should use the same protocols and product specifications, in a single window solution, to send digital pre-arrival information such as the FAL forms and other regional/national requirements, as defined in SOLAS regulation V/11.2 for ship reporting systems. This will ensure a common harmonised platform for all ship reporting systems.

National competent authorities should provide information about reporting formalities and ensure that all information regarding reporting is easy to understand, accessible and even automated for the master or operator.

This service should provide ICT tools for shipboard and shore-based personnel to streamline the processes and procedures associated with the generation and distribution of required reports, including retrieval of information from other ship systems (ballast management, waste management system, emission control system, navigation system, etc.) and from shore-based sources (cargo and passenger booking offices, crewing agents, stevedores, etc.).

Examples of information to provide can be:

|  |  |
| --- | --- |
| **Information related to:** | **Examples** |
| Reporting regulations | * What to report. The pre-arrival information may include ship particulars, arrival notice, crew and passenger lists, crew and passenger effects declarations, stores list, IMDG information, waste declaration, ship's certificates, ports of call list, dangerous cargo declaration and manifests, vaccination list, narcotic list, ship's money declaration, etc. * When / what to report (e.g. 24h, 48h, 72h, 96h before arrival) * To whom (e.g. immigration, police, port master, etc.) |
| Reporting tools | * Single Window, Web, app, etc. * Communication * Guidelines |
| Shore receivers  and support | * Contact information * Support information * Information about local reporting aid / support such as coastal radio stations and agencies |

The type of information required and reporting periods may differ from country to country and create some confusion on the ships' side, if the information requested is not clearly stated. Also, the reporting periods in some situations start as far in advance as 96 hours before a ship enters a coastal administration's waters. This may pose challenges with respect to the communication means available to provide the required information all along the transit.

In order to achieve the operational goal for future Vessel Shore Reporting, the ship should be able to make use of a complete set of product specifications that ensure a simple and harmonized system for providing reporting information”.

From the above description, a number of requirements could be suggested for the Vessel Shore Reporting maritime service. This paper describes a proposed solution which addresses these requirements as follows:

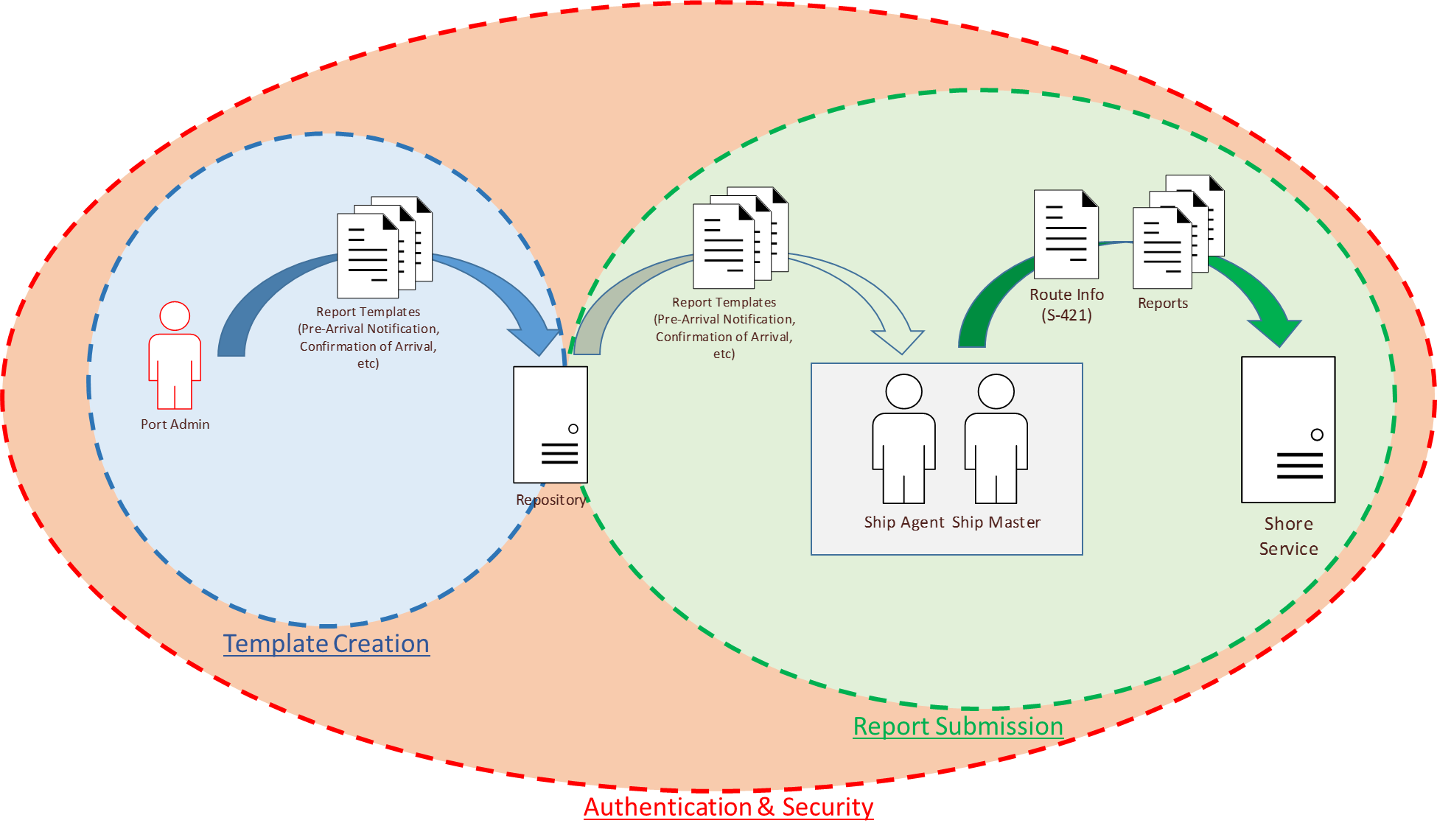
* Allow shipboard and shore-based personnel to submit, generate and distribute required reports
* Retrieve information from shore-based sources
* Alert user which reports need to be submitted and to whom
* Fulfil the exact requirements of each and every shore-based authority
* Generation of reports in the proper time period automatically
* Authorization by master before submission

The focus of the solution is to establish a standardized flow of information enabling users of the Vessel Shore Reporting maritime service to seamlessly exchange information between ships and shore. Requirements for compliance to the S-200 Product Specification or prevention of data tampering are not covered in this document.

# Discussion

## System Description

To alleviate the challenges faced by mariners in performing reporting tasks, the following framework is proposed to allow seamless submission of reports, and provides possibilities for automating parts of the process.



1. Solution Overview

The solution revolves around a Central Repository, where port authorities store instances of their report templates. Participants in the reporting flow will retrieve the report templates and perform their submission based on these templates.

Each report template stored in the repository comprises a set of data fields selected from a standardized pre-defined list known as the master list. Port authorities can create their customised templates by retrieving the relevant data fields from the master list. The master list standardises the data field names and avoids confusion due to the use of different names for the same data field. It ensures data interoperability between compliant systems, while allowing flexibility for port authorities to customize the set of information that they require vessels to submit.

### Framework components



1. Solution Architecture

The proposed framework comprises the following components:

* 1. Central repository of reporting templates

A Central Repository will be set up to store the latest reporting templates of the ports. Ports will be able to update their reporting templates as and when required. The Central Repository provides ship masters with the latest reporting templates for each port that the ship intends to visit, as well as the locations of the Shore Servers of the different ports.

* 1. Authentication/Authorization service provider

Authentication authentication/authorization service provider will manage the authentication and authorization of participants for vessel shore reporting. It authenticates the credentials of the participants, and performs authorization so that information can only be accessed by relevant parties. Details on the protocols to be used for authentication and authorization will not be covered in this paper, which focuses on the flow of information between the participants.

* 1. Shipboard Reporting System

Shipboard Reporting System is responsible for managing the information required by the destination port. The reporting system retrieves the data fields required by the destination port, and generates a user interface to allow ship master to fill in the necessary information.

* 1. Shore Client

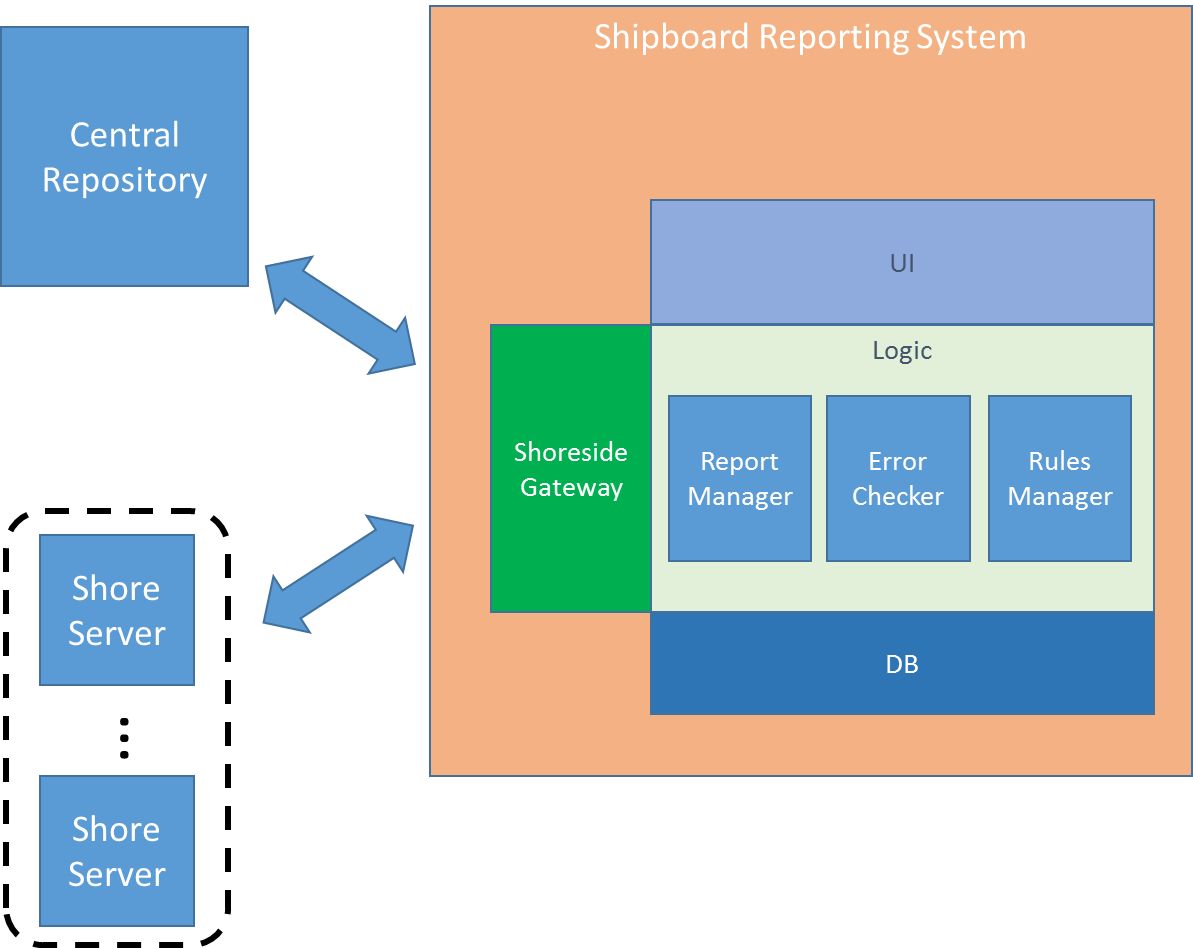
Shore Client provides an interface for users, other than the ship board users, to submit reports to the Shore Server. While the Shipboard Reporting System is located on board the ship and should be designed to minimize the use of network bandwidth, the Shore Client should not have this constraint and should facilitate ease of access for the users.

* 1. Shore Server

The Shore Server receives the reports that are sent by the Shipboard Reporting System or the Shore Client.

### Software Components of Shipboard Reporting System

Shipboard Reporting System will be a thick client, designed to minimize network interactions between the ship and Central Repository / Shore Servers. The Shipboard Reporting System includes several modules to help the ship master manage the reports to be submitted.



1. Software Components of the Shipboard Reporting System

Figure 3 shows the software components that form the Shipboard Reporting System. The Shipboard Reporting System is made up of:

* 1. UI Layer

This component is responsible for creating the user display and handles the interaction between the user and the screen.

* 1. Logic Layer

The logic layer can be divided into 3 main modules:

* + 1. Report Manager

Report Manager is responsible for handling of reports and report templates that are received from the Central Repository.

* + 1. Error Checker

Error Checker checks on the user’s inputs to the forms, and ensures that user’s inputs do not contain any errors.

* + 1. Rules Manager

Rules Manager checks on the rules to determine when the reports are to be submitted.

* 1. DB (Database) Layer

The DB (Database) is used to store information – e.g. report templates retrieved from the Central Repository, or report values that have been entered by the user but are pending transmission to the Shore Server.

## Operational Flow

The following sections describe the users’ interactions with the proposed system in the process of defining report templates for port authority and the process of report submission by a ship.

### Definition of Port Details

Before ship users can make use of the system, the relevant port information to enable the execution of ship reporting must be defined in the system.

Port authorities are required to define information of their port in the Central Repository. The information will include reporting area, URL of the destination port’s Shore Server as well as any other relevant information that the vessel needs to know. The reporting area can be used by the system to determine when the ship is approaching the destination port and advise the ship on the need to submit update and/or additional reports to the shore.

The information required to define a port should include:

* Port Name
* Country
* Email
* Telephone
* Reporting area
* Shore Server URL

### Definition of Report Template

Port authorities create the report templates that they require from inbound ships by selecting data elements from a master list.

The master list contains a global set of data fields to be used in the report template. This should be a standardized list shared by all participants of the Vessel Shore Reporting scheme.



1. Master list and reports formed from the master list

Rules can be attached to these reports, i.e. to define when the reports should be submitted, and the types of vessels to which the reports are applicable. For example, the report for Pre-Arrival Notification would be attached with the rule that defines the number of hours prior to arrival for which this information should be submitted, and also the types of vessels that are required to submit this information.

Rules that can be applied:

* Submission Trigger
* Time – X hours before ETA
* Location – Distance from port
* Location – When the ship moves into an area defined by the port authority
* Applicability
* Ship Type
* Cargo Type

### Port Call Initialization

This task is the first step of a ship’s call to a port, to inform the destination port of the ship’s intention to travel to the port. This can be performed by any user – ship master, agent, owner etc., from either the Shipboard Reporting System or the Shore Client (for simplicity, they will be collectively known as the client system in the remainder of this section).

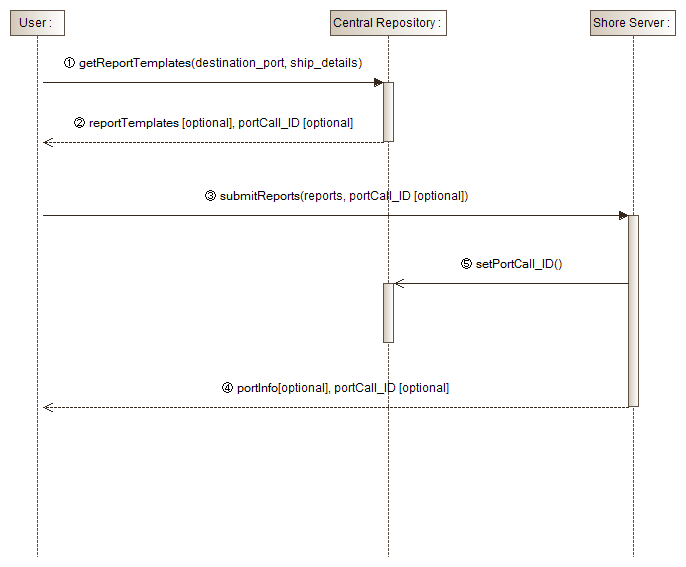
The user will first define the Port Call Initialization information which includes the destination port as well as details of the ship. The client system will submit the Port Call Initialization information to the Central Repository ①. If the client system already has a copy of the report templates for the destination port, it will include in the submission a hash[[3]](#footnote-4) of the report templates.

The Central Repository compares the submitted hash with its own hash, to check if the client system has the latest version of the report templates. The Central Repository will send the report templates if it determines that the client does not have the latest version of the templates, or if no hash is received from the client system ②.

In the event that a Notification of Arrival report (see section 3.2.4) has already been submitted to the destination port, the reply from the Central Repository will include the Port Call ID of the vessel. In this case, the client system will automatically request for the submitted report details from the destination port.

### Notification of Arrival Report

The report templates received from the Central Repository are used for the submission of a Notification of Arrival report to the destination port. Based on the report submission criteria, the system should highlight the mandatory fields before the report can be submitted. Upon successful submission of the report ③, the destination port will respond with a new Port Call ID, along with any important information that the destination port requires the ship to take note of ④. At the same time, the destination port sends the new Port Call ID to the Central Repository ⑤.



1. Submission of reports

After the Notification of Arrival Report has been submitted, more reports might have to be submitted while the ship journeys towards the destination port, depending on the criteria specified by the destination port (e.g. 12 hours before the ship’s ETA at the destination port, or when the ship reaches a specified boundary). These subsequent reports can be submitted via the Shore client or the Shipboard Reporting System.

### Subsequent Reports

In the event that the Shipboard Reporting System is not the entity that submits the Port Call Initialization and Notification of Arrival report but is responsible for the submission of subsequent reports, it can obtain the information of the current port call by connecting to the Central Repository. The Central Repository responds with the current Port Call ID, destination port and a hash of the reports that are required. If the Shipboard Reporting System already holds the reports with the returned hash, it shows that the ship currently holds the latest version of the reports. In the case that the hash is different, the ship will request for the full list of report templates that are required from the Central Repository.

After retrieving the required report templates, the Shipboard Reporting System automatically requests from the destination port the report data that have been submitted earlier for the current port call. The reports will be displayed to allow the user to make any changes, if necessary.

The above also applies to the case where the Shore client is not the entity that submits the Port Call Initialization and Notification of Arrival report but is responsible for the submission of subsequent reports.

### Automatic Reporting from Shipboard Reporting System

The user fills in the reports as required and saves the reports in the Shipboard Reporting System. The Shipboard Reporting System will automatically trigger the submission of these reports whenever required. Report submissions can be triggered by time, geographical location or external events, depending on the rules defined by the port authorities.

The Shipboard Reporting System will poll the Shore Server regularly for status updates, as well as after every submission of reports. This will allow the Shipboard Reporting System to inform the user of the current reporting status.

For an example of the reporting process, refer to Annex A.

## Other Technical Considerations

While not covered in this paper, the following lists some of the aspects that the solution will have to consider in order to meet the needs of mariners.

### Security, authentication and authorization

As the information that a vessel shares with port authorities could be sensitive in nature, it is important to ensure that transmission of the information is secured and cannot be intercepted by any unauthorized third party.

Every exchange of data between any two participants of the Vessel Shore Reporting should be protected by data encryption. This can be achieved by implementing Transport Layer Security (TLS) over the data exchange mechanism. The authenticity of the components (Authentication/Authorization service provider, Central Repository, Shipboard Reporting System and Shore Server) can also be provided with the inclusion of a PKI (Public Key Infrastructure).

There should be a common authorization framework (implemented by the authorization service provider) shared by all participants of the vessel shore reporting system, and access rights should be clearly defined. This is essential to ensure that reports will be sent securely to the correct parties.

### Integration to IMO GISIS (Global Integrated Shipping Information System)

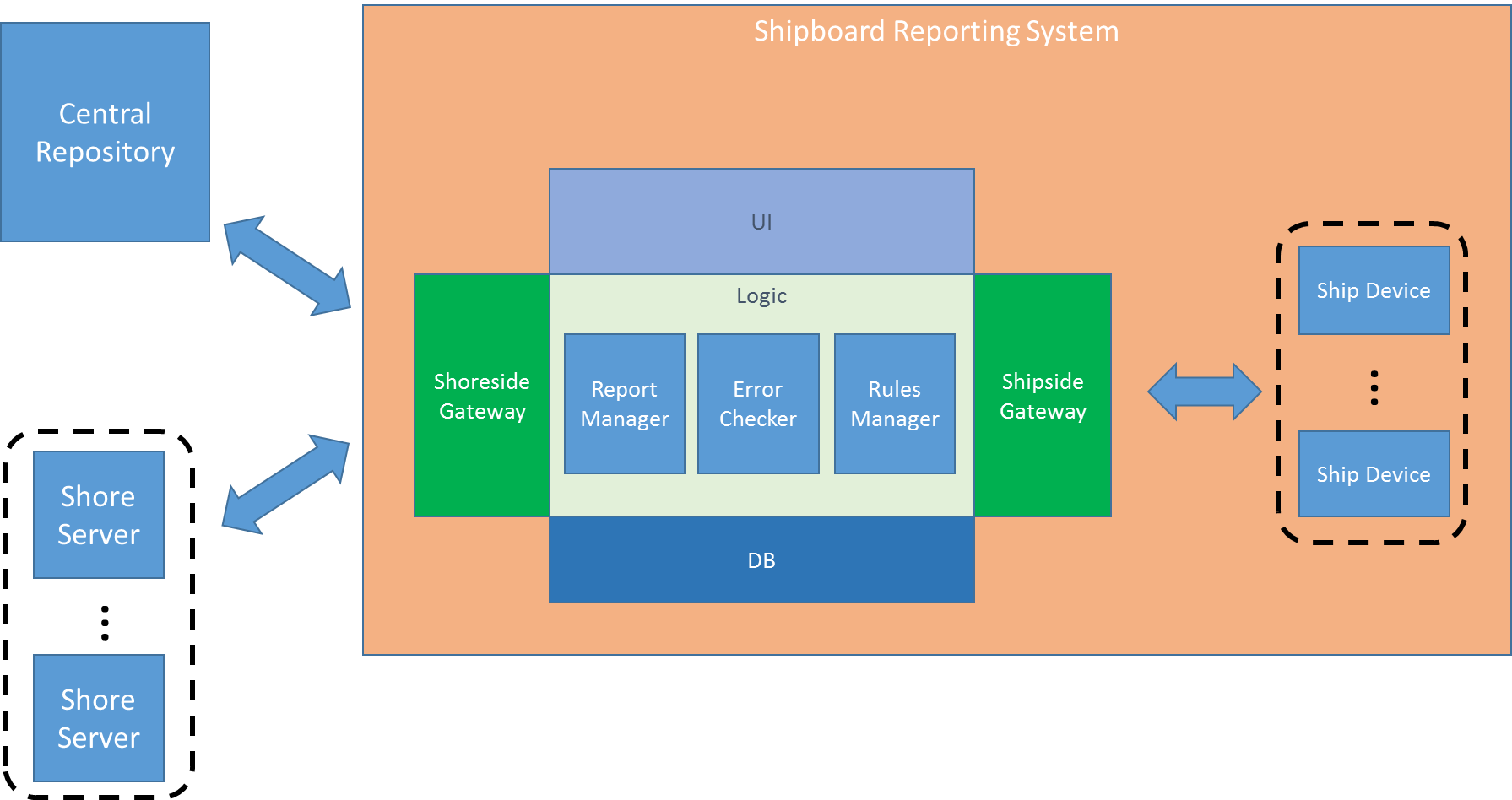
The GISIS (<https://gisis.imo.org>) is an Information System developed by IMO providing public access to sets of data collected by IMO. One possible enhancement would be to share information stored in the Central Repository with the GISIS. Information such as the report templates or port details can be shared with the GISIS portal.

Conversely, information that is available on the GISIS portal can be shared with the Central Repository. Connecting the Central Repository with the GISIS allows important and relevant information to be seamlessly shared with the ships whenever they initialize a new voyage to a port.

### Integration to IOT

As ship systems become more integrated and more IOT solutions are implemented on ships, it is possible to automatically retrieve the relevant information from the ship devices and populate these information in the reports.

A gateway software could be added to the Shipboard Reporting System to allow interactions with ship devices, and to retrieve the required information.



1. Integration with ship devices

# References

|  |  |
| --- | --- |
| [1] | IALA, “MARITIME SERVICES DESCRIPTIONS IN THE CONTEXT OF E-NAVIGATION,” *NCSR 6/WP.4 Annex 10,* pp. 37-38. |

# Action requested of the Committee

The Committee is requested to consider the proposed solution described in this paper, for possible incorporation into the IALA document titled Maritime Services Description for MS8 (Vessel Shore Reporting).

Annex A – EXAMPLE (SINGAPORE PORT)

The Maritime and Port Authority of Singapore defines the port details in the system, clearly indicating the reporting boundaries and contact details for the port authority. This information is stored at the Central Repository for any ship that wishes to sail to Singapore.

The ship Digital Trader intends to travel from the port of Shanghai to the port of Singapore. The ship’s agent logs into the system and selects the port of Singapore as its destination. The system then retrieves the URL address of Singapore port’s Shore Server and the required report templates from the Central Repository, and displays the templates to the agent. Out of the templates, the Pre-Arrival Notification report is marked as mandatory to complete in order to initialize the port call. The agent fills in the Pre-Arrival Notification and submits it to the Shore Server.

On receiving the Pre-Arrival Notification report, the Shore Server generates a Port Call ID for Digital Trader and replies to the agent’s submission with this Port Call ID. The Shore Server will also send this Port Call ID to the Central Repository.

On-board the Digital Trader, the Shipboard Reporting System contacts the Central Repository to retrieve the URL address of Singapore port and the reports required. The Central Repository replies with these information, along with the Port Call ID.

The Shipboard Reporting System sends a request to the Singapore port’s Shore Server to retrieve the information that has been submitted so far for the current port call. The ship master continues to fill in any other reports that have not been submitted.

As the ship enters the reporting area for Singapore port waters, the rule for the Confirmation of Arrival report triggers the Shipboard Reporting System to automatically send the Confirmation of Arrival report to the Shore Server.

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-2)
2. Leave open if uncertain [↑](#footnote-ref-3)
3. <https://www.webopedia.com/TERM/H/hashing.html>

   “Producing hash values for accessing data or for security. A hash value (or simply hash), also called a message digest, is a number generated from a string of text. The hash is substantially smaller than the text itself, and is generated by a formula in such a way that it is extremely unlikely that some other text will produce the same hash value.” [↑](#footnote-ref-4)