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Agenda item [[2]](#footnote-2) 4

Technical Domain / Task Number 2 WG4 / 5.1.9 MSP8 Vessel Shore Reporting

Author(s) / Submitter(s) Prof. Yu Yung-Ho, Fred Pot

Automating Ship Reporting

Proposal for a roadmap for roll-out of automated ship reporting

# Summary

This paper describes the Vessel Shore Reporting Management System developed by Prof. Yu Yung-Ho. The paper also proposes a high-level architecture for automated ship reporting, identifying components that for which world-wide standard will need to be developed to create an environment (“eco-system”) and components that comply with standardized components but could be offered as solutions by vendors. Lastly the paper proposes a roadmap for the roll-out of automated ship reporting.

## Purpose of the document

The ENAV Committee is invited to consider adoption of the automated ship reporting architecture.

The ENAV Committee is invited to consider proposing an action item for NCSR4 that requests IALA and IEC to develop standards that will create a viable eco-system for vendors to design, develop, market and support automated ship reporting solutions.

The ENAV Committee is invited to accept responsibility for creation and maintenance of a ship report library and for development and maintenance of the S-200 Product Specification of the ship reporting database.

## Related documents

Presentation of the [Vessel Shore Reporting Management System](https://www.dropbox.com/s/wq45xqem0luv3sl/VRMS%20%28Vessel%20Report%20Management%20System%29.pdf?dl=0)

Presentation of [Proposal for a roadmap for roll-out of automated ship reporting](https://www.dropbox.com/s/8a33x22wgei1h24/2016%20e-Nav%20Underway%20Intl%20Presentation%20v1.1.pptx?dl=0)

# Background

IMO’s Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) 1st session in March 2014 [adopted](http://www.uscg.mil/imo/ncsr/docs/ncsr1-report.pdf) “*S2: means for standardized and automated reporting”* as a prioritized solution. Task T9 of the e-navigation Strategic Implementation Plan (SIP) specifically lists *“Investigate the best way to automate the collection of internal ship data for reporting including static and dynamic information”* in 2016.

# Discussion

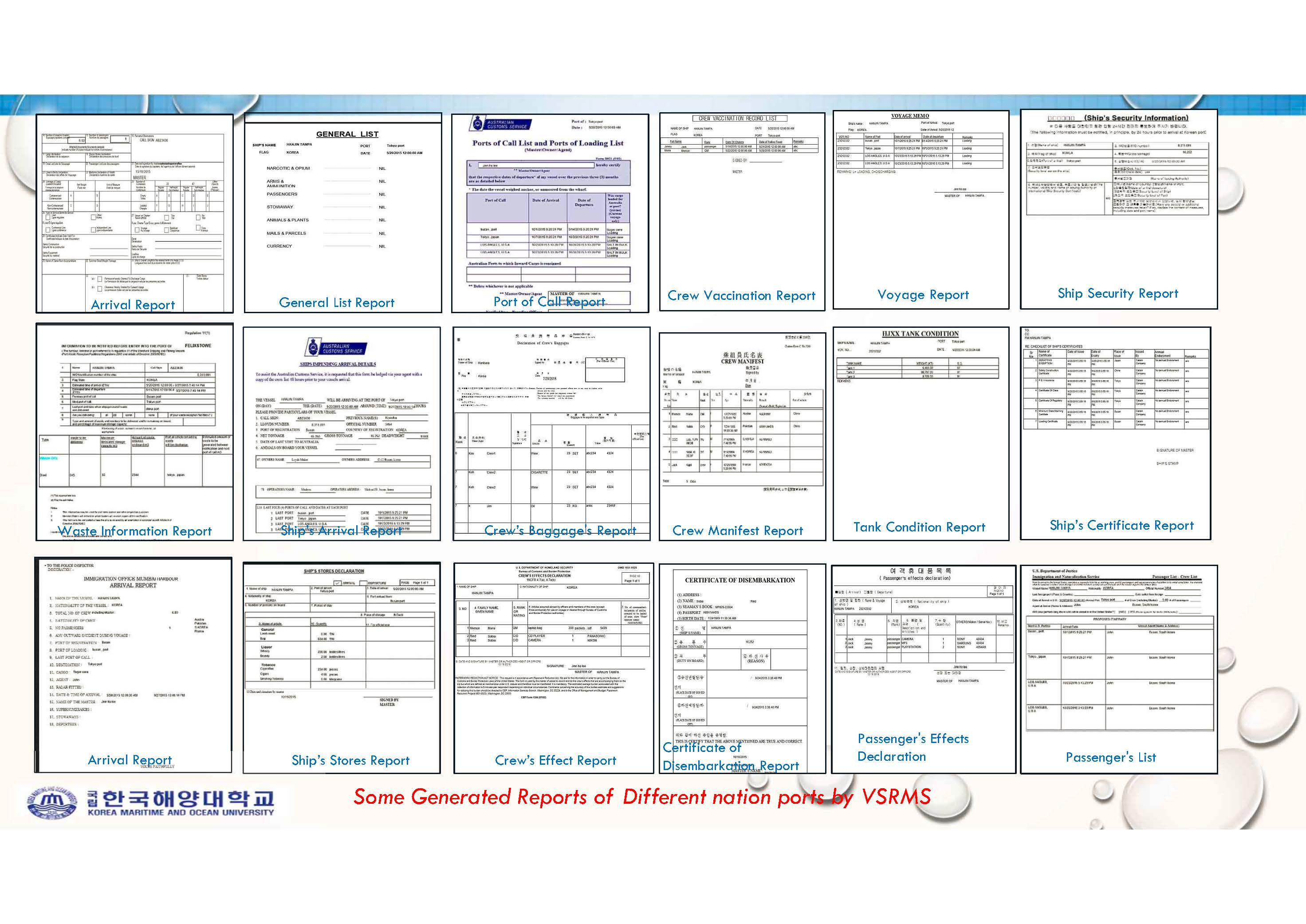
## Vessel Shore Reporting Management System

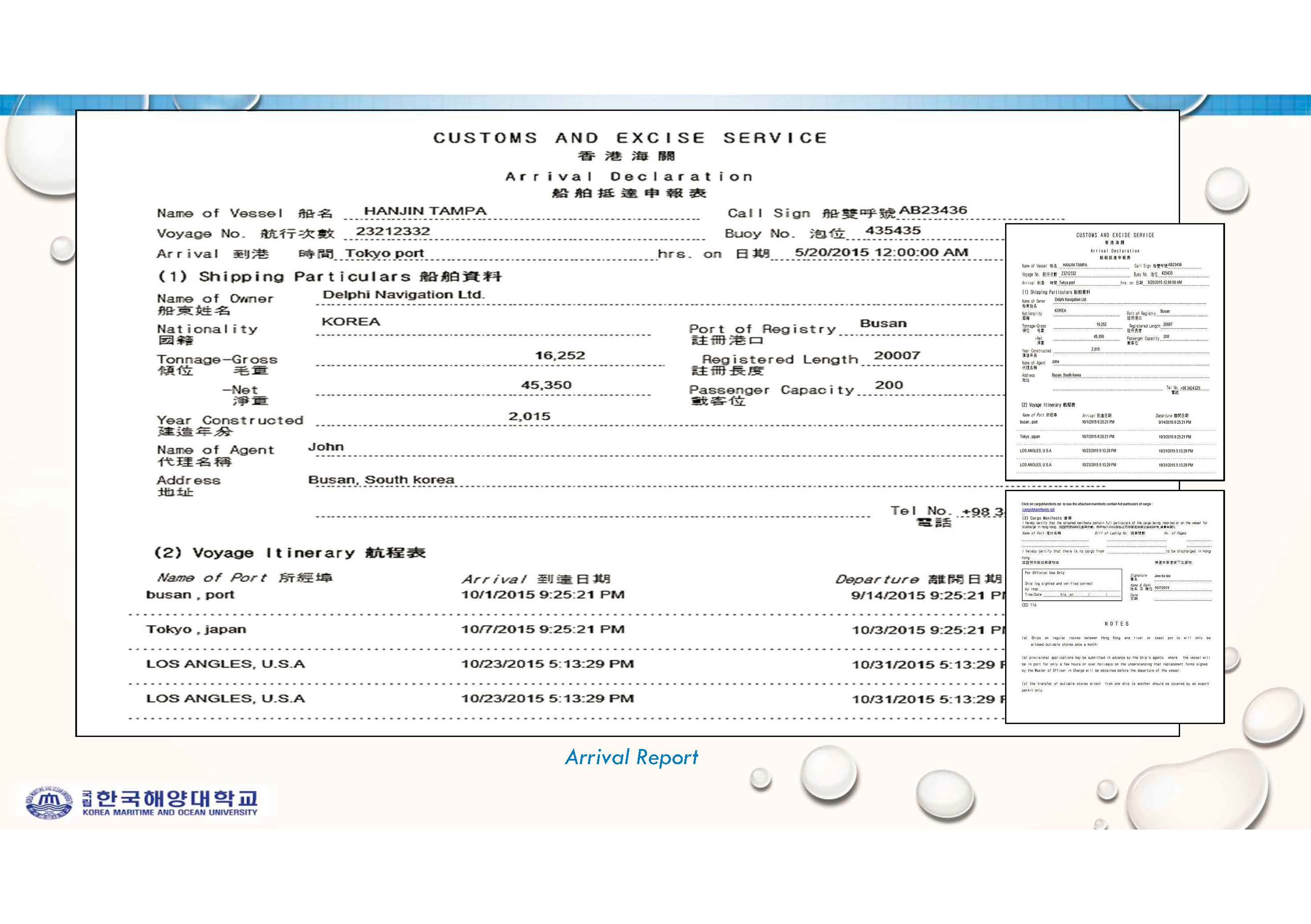


This system is expected to significantly reduce the administrative burden on the bridge team to submit reports to shore-based authorities. It was developed by Prof. Yu Yung-Ho in cooperation with [Hanjin Shipping Co.](http://www.hanjin.com/hanjin/CUP_HOM_1001.do) The figure above is a screenshot of the main user interface. Most of the buttons will open input forms for information that is used to generate the necessary reports. In most cases the information that is entered into the system is used by several different reports to comply with the requirements of a variety of shore-side authorities.

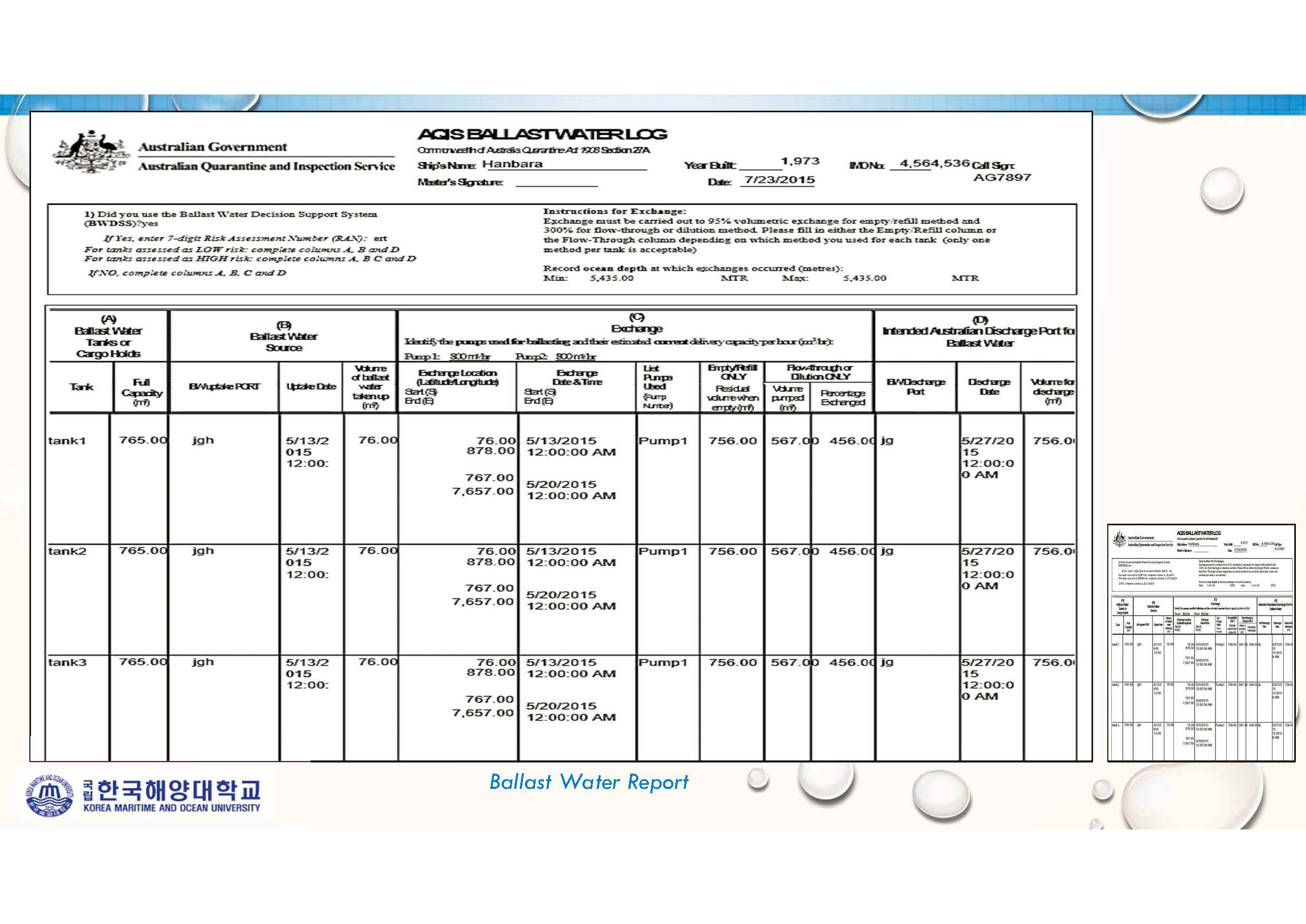
At the bottom of the user interface is a button that is used to generate ship reports. Click [here](https://www.dropbox.com/s/qktgjo8453pz7yv/Generate_Report_Demo_Video%20-%20Short%20Version.mov?dl=0) for a 1 minute video that shows how to generate a Hong Kong Arrival Declaration.

The system can generate a number of reports. The following figure shows a sampling of reports.

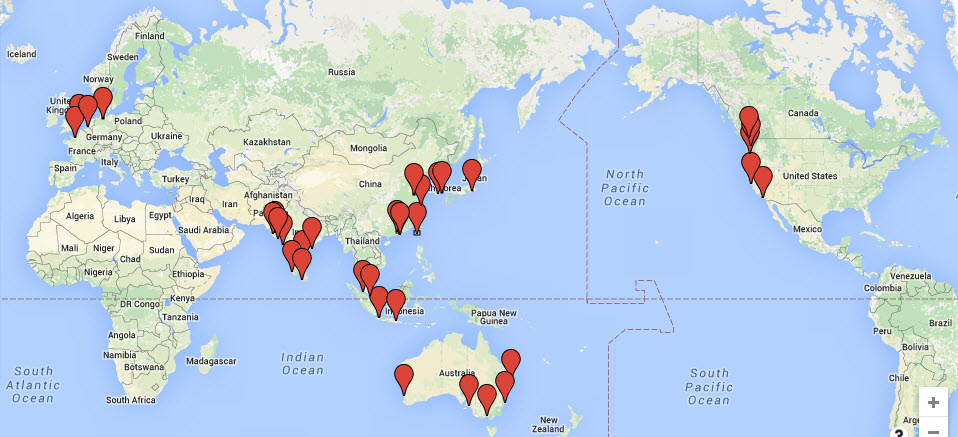




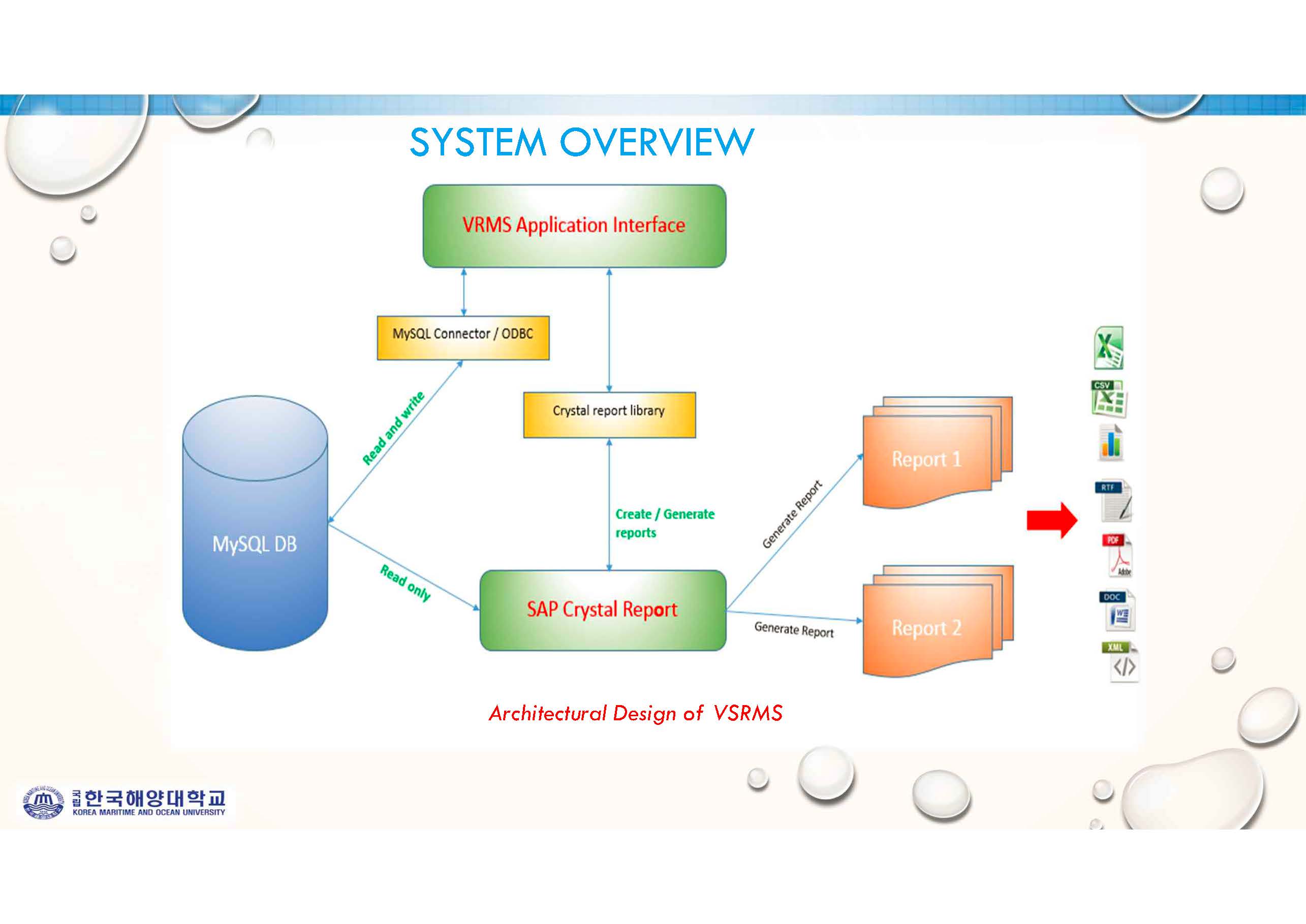
The figure above shows the Arrival Declaration for the port of Tokyo.



The figure above shows the Ballast Water Log for Australian Ports.

VSRMS can generate all required reports for 33 ports (see figure below).

The system runs a Personal Computer.



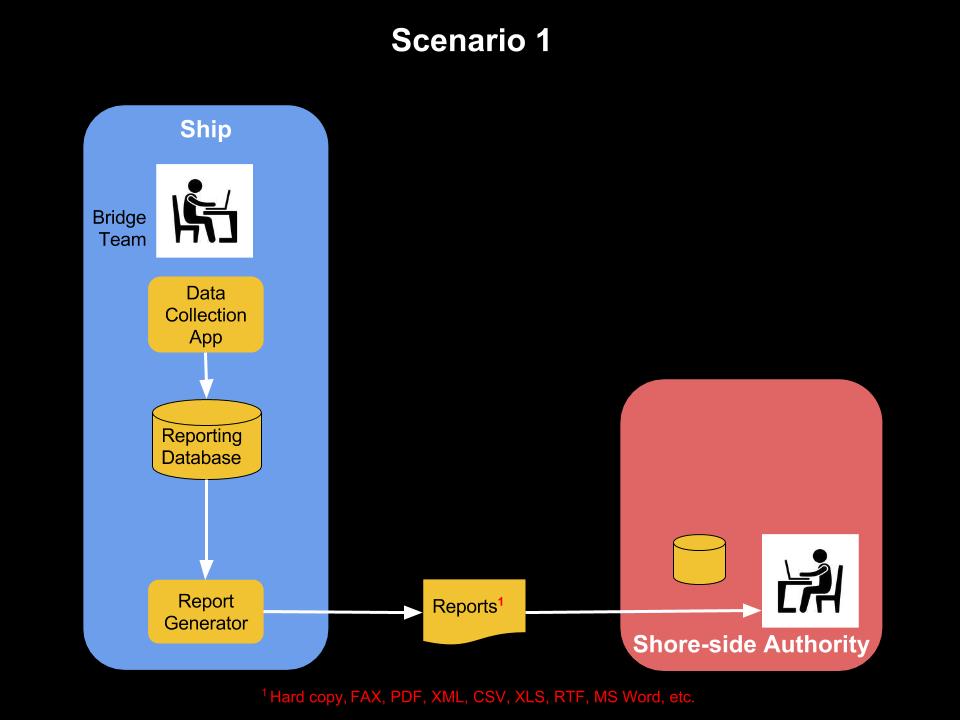
The above figure shows its architecture. The VSRMS user interface application uses an Open Database Connectivity ([ODBC](https://en.wikipedia.org/wiki/Open_Database_Connectivity)) connector with a [MySQL](https://www.mysql.com/) (Open Source) database for data entry purposes. A commonly used report generator ([SAP Crystal Reports](http://www.sap.com/solution/sme/software/analytics/crystal-reports/index.html)) is used to generate the reports, using a library of report templates. The reports can be MS Excel spreadsheets, Comma Separated Values (CSV), XML files, Adobe PDF’s, MS Word Documents, Rich Text Files, etc. The reports can be printed, saved to a USB thumb drive, faxed, sent as attachments to e-mails or uploaded to a (local or cloud-based) reporting database as an XML file.

## Ship Reporting Architecture proposal

### Scenario 1

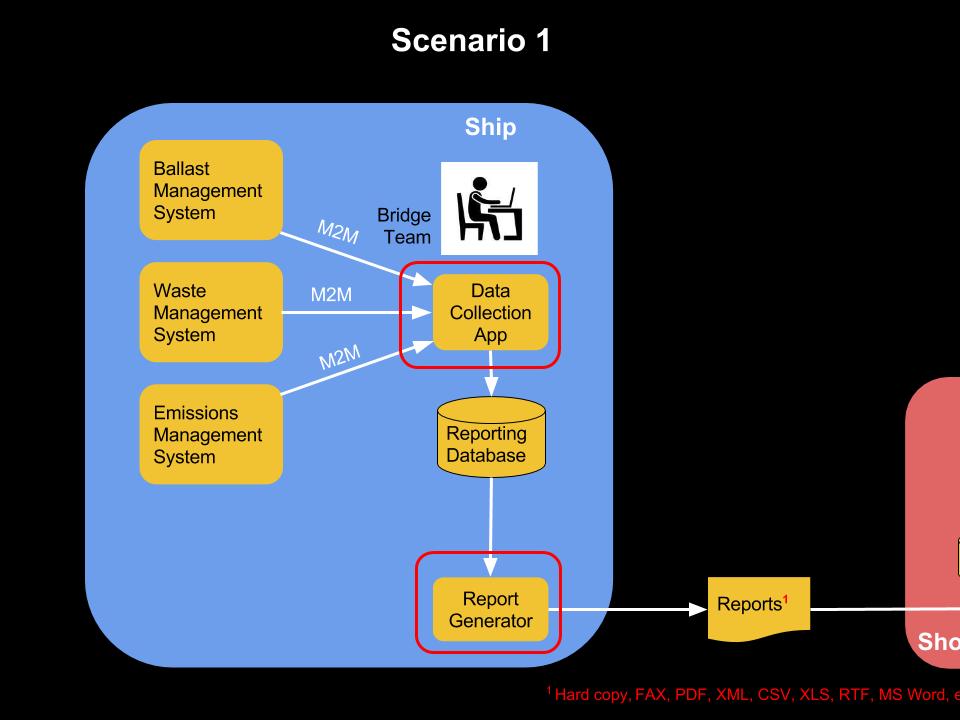
In this scenario the system is limited to an on-board solution fully under the control of shipping lines.

The figure below describes the essential elements of an on-board ship reporting system



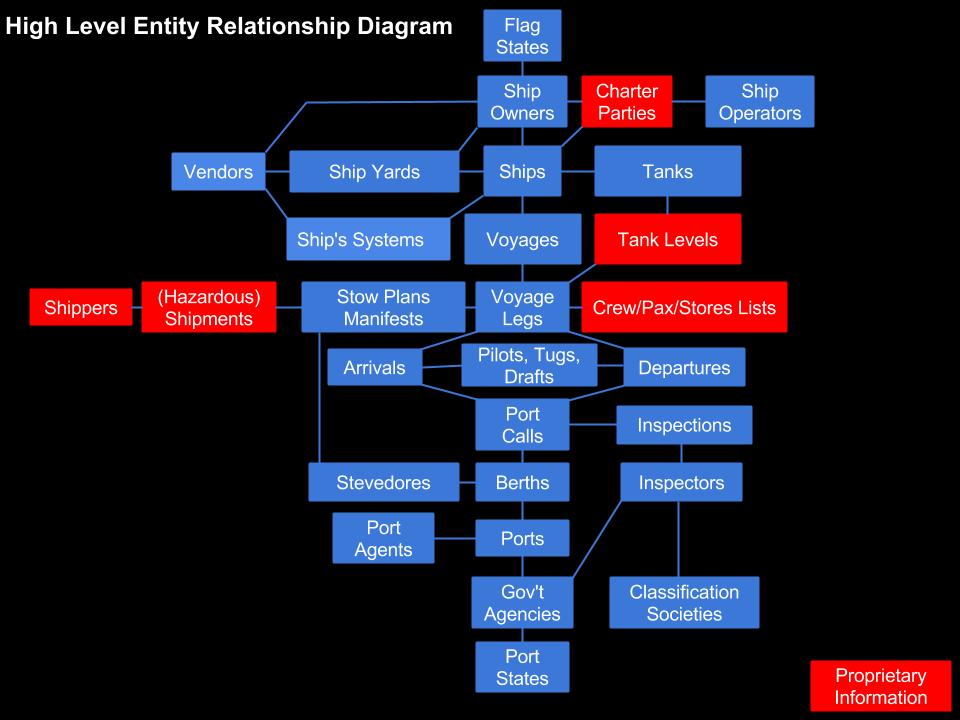
Apart from the Vessel Shore Reporting Management System, there already is at least one vendor that offers this solution ([DNV.GL Navigator](https://www.dnvgl.com/services/port-clearance-assistance-navigator-port-1440)). Also, some shipping lines have already developed in-house solutions.

To automate collection of information contained in other on board systems such as the Ballast Management System, the Waste Management System and the Emission Management System, the On-Board Data Collection Application needs to be able to receive information from such systems. There are many different varieties of ballast, waste and emission managements systems. This will make it almost impossible for vendors to develop, maintain and support on-board data collection applications unless we standardize the Machine-to-Machine (M2M) interfaces. A plausible candidate for such a standard is the [emerging interface standard](http://openinterconnect.org/) for the Internet-of-Things ([IoT](https://en.wikipedia.org/wiki/Internet_of_Things)).



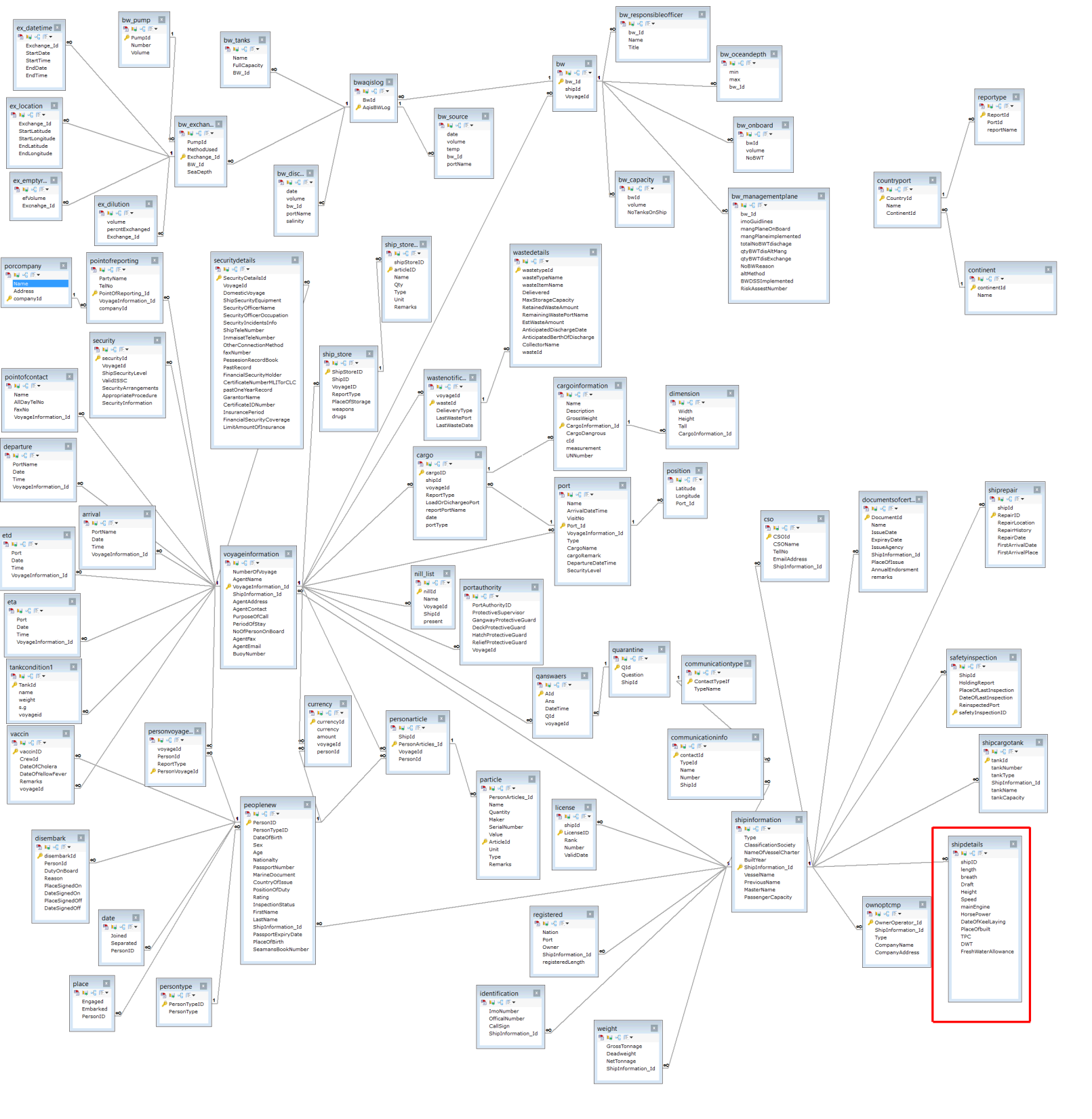
An international standard (S-200 Product Specification) for the structure of the reporting database should be developed for a number of reasons. It will allow shipping lines to mix-and-match solutions from a variety of vendors of data collection and report generation solutions and it will eventually allow shore-based authorities to query a single, cloud-based, database to download relevant information into their own system (see “Scenario 3” described later in this paper).

The Vessel Shore Reporting Management System (VSRMS) uses a database structure (entity relationship diagram) that is a candidate for the S-200 Product Specification. A high-level description of the reporting database is provided in the next figure.

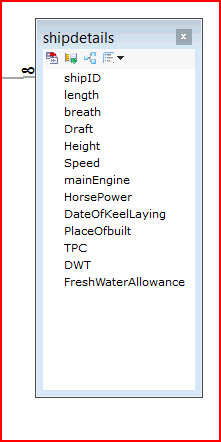


It shows database tables and their interrelationships. At the top it shows a table with properties of a Flag State linked to a table of ship owners, linked to a table of their ships, their voyages, voyage legs, arrivals and departures, port calls, berths, ports, Government Agencies and Port States. Additional information is contained in related tables, some of which contain proprietary information.

The actual VSRMS database structure is shown in the figure below



The highlighted table is shown in the figure below



Report Generation solutions from vendors should produce reports that are officially recognized to fulfill shore-based authorities’ requirements. To create an eco-system in which vendors of report generation solutions can thrive, we need to develop and maintain a library of ship reports that is open to vendors. This library should catalog all required reports and their properties. The Federation of National Associations of Ship Brokers and Agents ([FONASBA](https://www.fonasba.com/ship-agents-and-brokers), an association of ship agents with IMO Observer Status) may be in a position to assist with cataloguing ship reports.

A unique identifier for each report should be adopted. This paper proposed to extend the Uniform Resource Name ([URN](https://en.wikipedia.org/wiki/Uniform_Resource_Name)) naming system for this purpose. This proposal suggests that the following structure be adopted (see figure below)



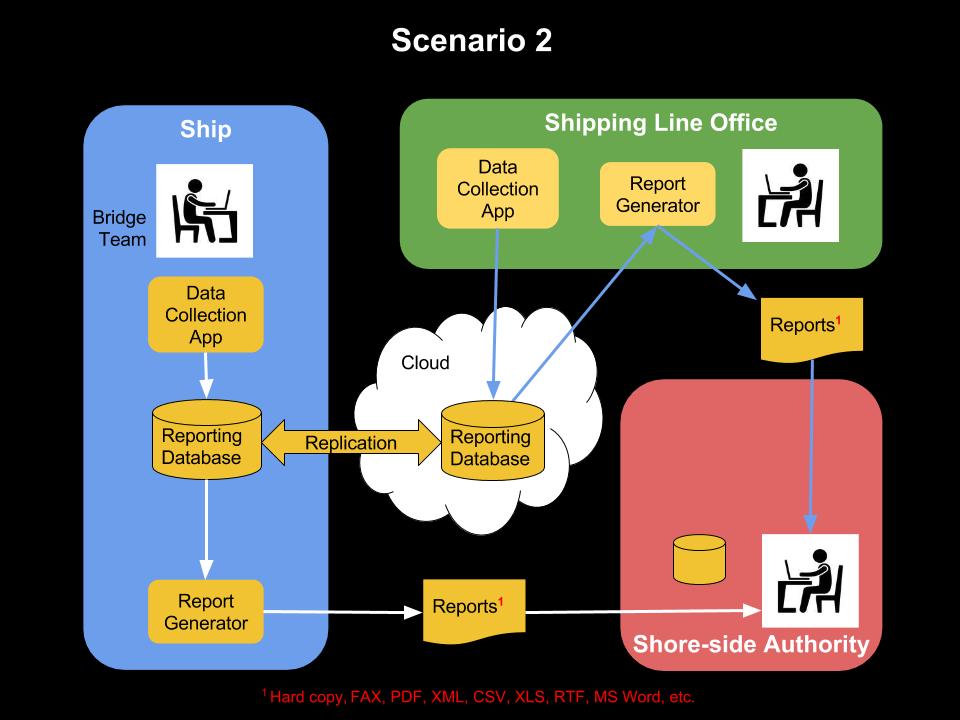
The library should contain the properties of each report:

* Type (Single Window, Customs, Health, etc.)
* Submission Criteria (Who?, When?, Where?, How?)
* Format (Hard Copy, Fax, PDF, XML, etc.)
* Languages (i.e. Korean & English)
* Form Layout Template
* Fields (Vessel Name, Arrival Port, etc.)
* Report Database Sources (Table name, Field name)

Report generation solution vendors should be encouraged to add a feature that will make it easy for bridge teams to send reports in electronic form to shore-based authorities if they accept electronic reports. The Maritime Cloud will provide a complete messaging infrastructure with authentication, role-based access authorization and encryption when necessary. In the meantime currently available networks (Satellite, WiFi, LTE) should be used to submit electronic reports as attachments to an e-mail.

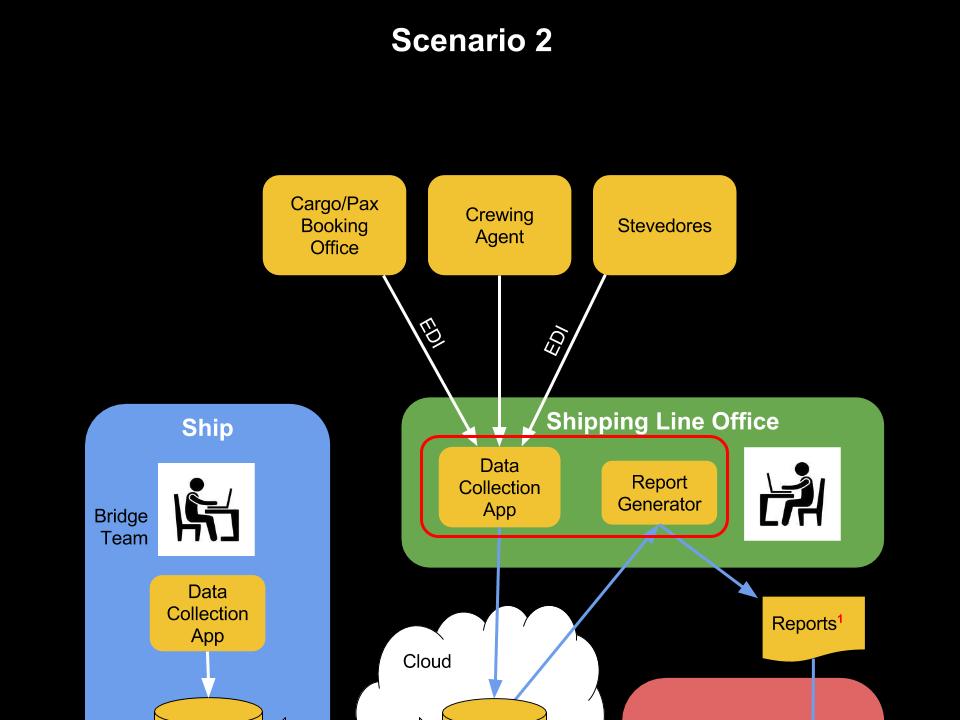
### Scenario 2

The above describes “Scenario 1”. The reports are generated by an on-board system that is under the control of the shipping line. The following describes an extension of this scenario. In “Scenario 2” the on-board reporting database is replicated to the cloud. This scenario will only be adopted by shipping lines if they are confident that their cloud-based reporting information is secure and that access to it is completely under their control. See figure below.



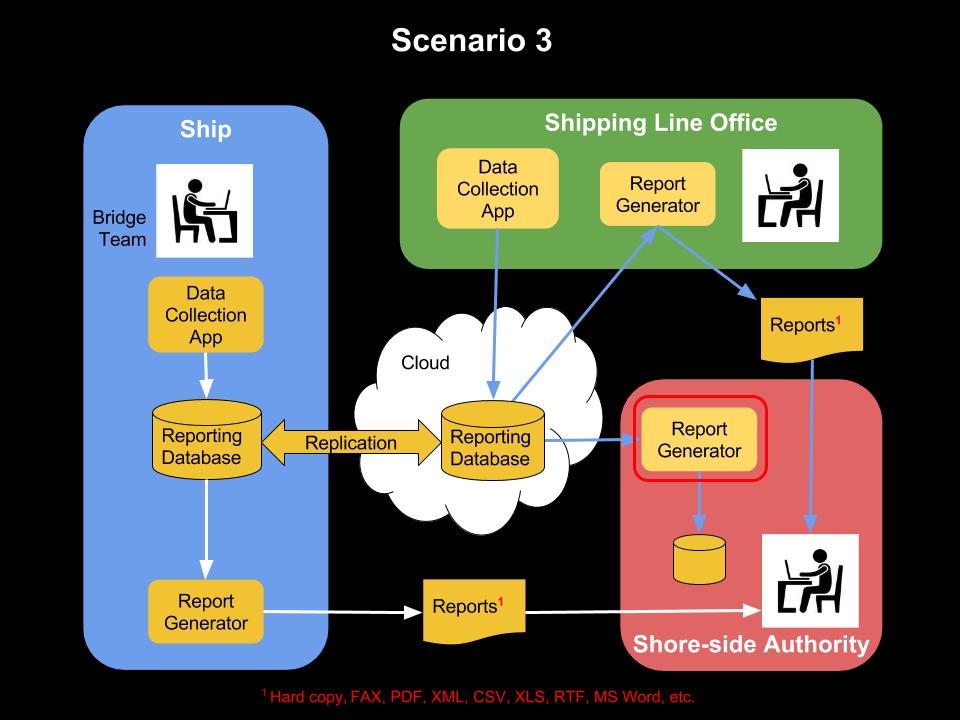
In this scenario the bridge team can delegate much of the administrative burden of submitting reports to shore-based authorities to shore-based shipping line personnel or, at the shipping line’s option, to their ship agents.

In this scenario the data collection solutions that vendors will offer should allow direct transfer of cargo, passenger, crew and stowage information from 3rd parties using well established Electronic Data Interchange ([EDI](https://en.wikipedia.org/wiki/GS1_EDI)) standards as shown in the figure below.



### Scenario 3

In “Scenario 3” shipping lines authorize shore-based authorities to query the cloud-based reporting database for relevant information and use the query results to populate their own systems. See figure below.



Shore-based authorities would either develop their own report generators or rely on vendors to provide an appropriate query/subscription solution.

## Proposed Implementation Road Map

There is some urgency to roll-out standards for automated ship reporting. Shipping lines are addressing the issue by developing in-house solutions and the commercial market for automated ship reporting is expected to grow beyond DNV.GL’s Navigator product. If shipping lines and vendors design proprietary reporting databases for their solutions then it will become unlikely that they will accept and adopt an international S-200 Product Specification for the database. If no such standard is adopted then shipping lines will lose the option to mix-and-match ship reporting solutions from different vendors and collaboration between shipping lines and shore-based authorities on sharing information will likely be too complex to be successful.

The goal of this roll-out proposal is to create an environment (“eco-system”) in which vendors of automated ship reporting solutions can thrive and thus provide shipping lines with a rich field of options to choose from. If an international S-200 Product Specification for the reporting database is adopted by the Maritime Industry then solutions are likely to be tailored to the needs of shipping companies and also to needs of shore-based authorities.

Development of the S-200 Product Specification will need to be based on the reports that the solutions will need to generate, therefore cataloguing reports in a library will be the first step.

The following steps are proposed to roll-out automated ship reporting:

1. NCRS4 requests IALA & IEC to develop Automated Ship Reporting Standards to create a viable “eco” system for vendors (and shipping lines).
2. IALA identifies and categorizes Ship Reports in an open library with bi-annual updates, possibly assisted in this effort by [FONASBA](https://www.fonasba.com/ship-agents-and-brokers).
3. IALA designs and publishes the Reporting Database S-200 PS with bi-annual updates
4. IEC adopts standards for M2M interfaces between data collection applications and on-board systems (i.e. Ballast, Waste, Emission, etc.). Possibly by adopting the [emerging interface standard](http://openinterconnect.org/) for [IoT](https://en.wikipedia.org/wiki/Internet_of_Things).
5. ICS/BIMCO set-up and administer access to the cloud-based Reporting Database and authenticate users at the direction of individual shipping lines
6. ICS/BIMCO develop and publish software that enable automated ship reporting solution developers to “self-test” compliance with Ship Reporting Standards (i.e. the S-200 Product Specification of the reporting database as well as the Report Library)
7. Vendors (and Shipping Lines) develop, market and maintain automated ship reporting solutions
8. Shore-side Authorities develop and maintain Reporting Database query tools

# References

[e-Navigation Strategy Implementation Plan (SIP)](http://www.imo.org/en/OurWork/Safety/Navigation/Documents/enavigation/SIP.pdf) NCSR1/28, Annex 7.

[Strategy for the development and implementation of e-navigation](http://www.imo.org/en/OurWork/Safety/Navigation/Documents/enavigation/MSC%2085%20-%20annex%2020%20-%20Strategy%20for%20the%20development%20and%20implementation%20of%20e-nav.pdf) MSC85/26 Annex 20

# Action requested of the Committee

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1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-1)
2. Leave open if uncertain [↑](#footnote-ref-2)