

## Appendix C.2

### LRIT Ship Database

### (Including Central Country Database)

### Functions and Architecture

Date: 19/07/2016

Version: 1.0

## 1 Introduction

This document gives an overview of the LRIT Ship Database (LRIT Ship DB), including EMSA Central Country Database.

EMSA hosts and operates the LRIT Ship DB since **March 2009**. In 2013 a new module was created to implement the EMSA **Central Country Database** (CCD, initially named as Country Code Base Registry or CCBR).

CCD shares the same database and country reference tables as LRIT Ship DB. All the components of LRIT Ship DB and CCD (including web services, portlets or middleware adaptors) are to be covered under the same framework contract, despite the fact that the CCD is presented in EMSA's Portal as part of a community called Common Management Console (CMC).

The two following main chapters provide an overview of the LRIT Ship DB and of the CCD, providing also references to more detailed documentation.

## 2 LRIT Ship DB

### 2.1 Overview

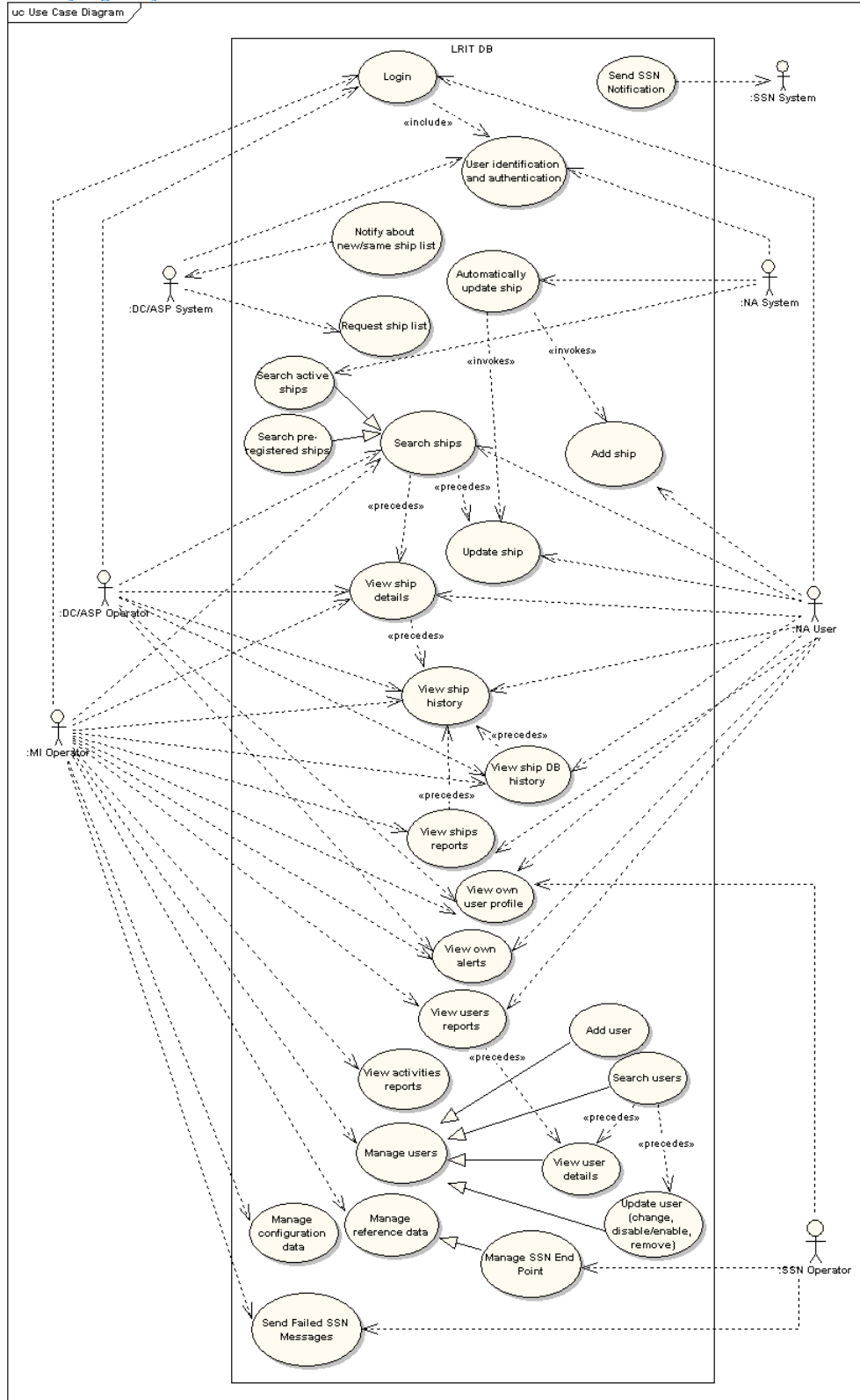
The Long-Range Identification and Tracking (LRIT) system is a global ship tracking service developed under the co-ordination of the International Maritime Organization (IMO) and available to IMO Contracting Governments.

The LRIT Data Centres (DC) collect, store and provide LRIT information transmitted by ships (ship position reports) to users worldwide through an Internet based network.

The EU LRIT Ship Database is an element of the EU LRIT Cooperative Data Centre (EU LRIT CDC). This element is responsible for receiving, storing and disseminating information on ships that report to the EU LRIT CDC and is on line accessible to all Member States and associated countries.

The EU LRIT Ship Database application has 5 groups of human users, each one with a role that allows the access to a set of functionalities, and 3 types of system users.

To provide an overall view of the EU LRIT Ship Database software functionalities and a high-level schematization of the relations between it and the several users, a Use Case diagram is presented in Figure 1.



**Figure 1 - LRIT Ship DB Application Use Cases**

All Use Cases have a dependency relation with the Use Case “Login” that is not displayed for simplification reasons; this means that, in order to perform all the other Use Case operations, the Login operation must have been previously

performed with success. The “Login” Use Case has a dependency “include” relation with the “User identification and authentication” operation since that, as part of the Login, the user identification and authentication must be successfully performed.

There are two other types of dependency relations between Use Cases represented in the diagram: the “invokes” relation and the “precedes” relation.

The “invokes” relation from the Use Case “Automatically update ship” to the “Add ship” and “Update ship” Use Cases, means that the operations of the automatically update ship functionality may call (use) the operations of these two functionalities.

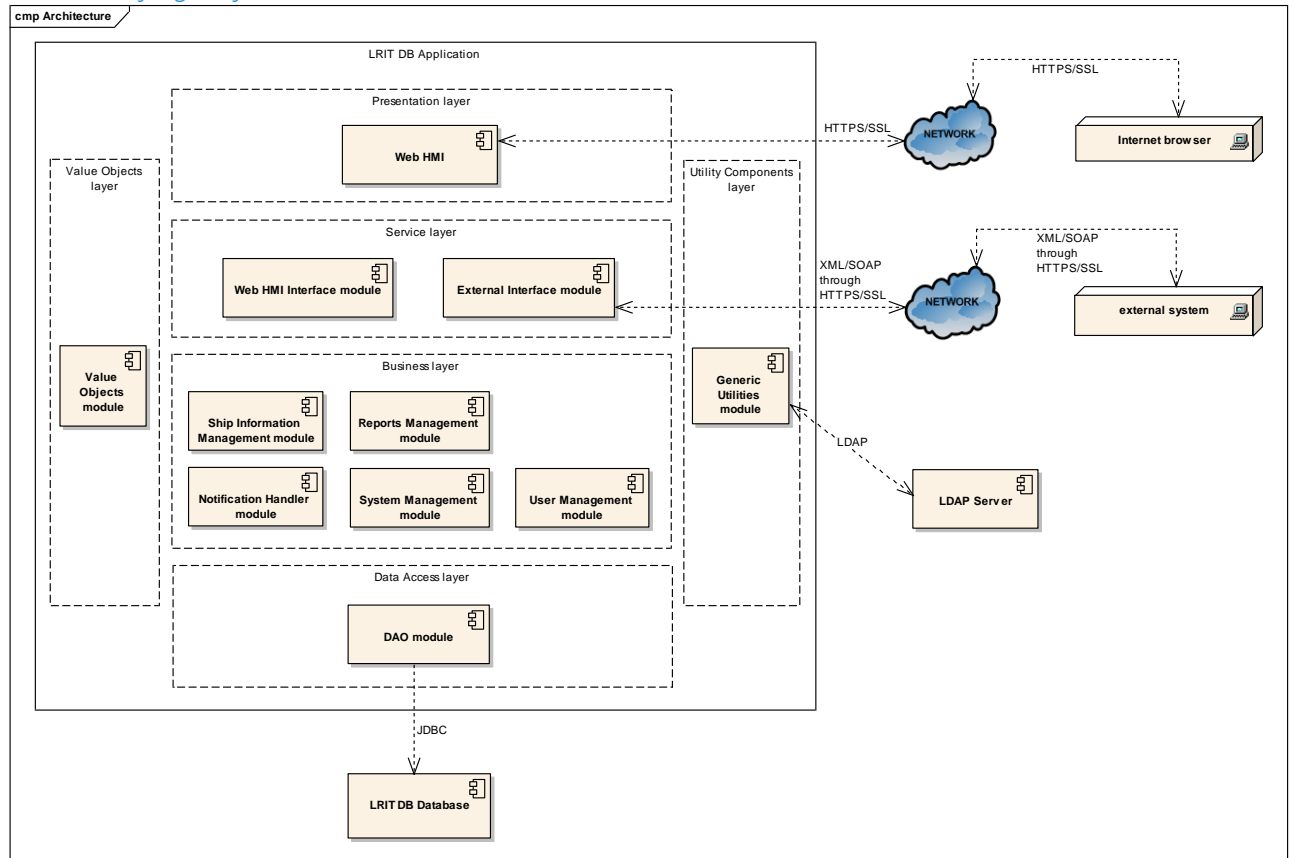
The “precedes” relation is represented between several Use Cases. Let’s take one situation as example, since the meaning is always the same: the “Search ships” Use Case has a dependency relation of this type with the “View ship details” Use Case since the visualization of ship details can only be performed if a ships’ search was previously performed, that is, the visualization function is only accessible in the screen that results from a search.

## 2.2 Design

The design of the LRIT SHIP DB system follows a common approach in software engineering and, in particular, for J2EE applications: software layering. In this approach, each layer provides functionality for one concern of the system and the layers are organized in a way that each one provides support and base functionality for other layers.

The LRIT SHIP DB Application is composed by 6 layers: the Data Access layer, the Business layer, the Service layer, the Presentation layer, the Value Objects layer and the Utility Components layer.

The following figure represents the organization of the mentioned layers, the components within them and the interfaces with the exterior (for simplification purposes, the application internal interfaces are omitted).



**Figure 2: LRIT Ship DB Application Architecture**

The Presentation layer is responsible for controlling the display to the human users. This tier presents data, collects user input, controls page navigation, and delivers the user input to the Business layer. It also validates user input and maintains the application's session state.

The Service layer publishes the business objects capabilities. The objects in this type of layer are usually called deployment wrappers and can be Enterprise Beans (for instance, session beans), Web Services, RMI (Remote Method Invocation) Services or even CORBA (Common Object Request Broker Architecture) Services. In the LRIT SHIP DB application the service layer will publish the business objects functionality as Web Services (in the External Interface module) and as a Java API (in the Web HMI Interface module).

The Business layer is responsible for managing the business processing rules and logic. The objects in this layer combine data with business rules, constraints and activities, and often use and coordinate the activities of multiple DAOs. These business objects shall be separated from Value Objects, DAOs and the Service layer to maximize the possibility of reuse and minimize maintenance complexity.

The Data Access layer is responsible for the communication with the LRIT SHIP DB Database. All the operations of getting, adding, updating or removing data from the database will be managed by this module. The main reason to separate the data access from the rest of the application is that it is easier to switch data sources and to share Data Access Objects (DAOs) with other applications.

The Value Objects layer is the one that contains lightweight structures for the information that are in some texts referred to as data transfer objects. The value objects that will be in this layer will be used in the communication among the other layers of the application.

The Utility Components layer has the generic application utilities. Any third-party utilities, APIs or packages needed by the application belong in this layer.

The LRIT SHIP DB Database (Oracle 12c) will store all the LRIT ship data and is to be implemented as a relational database.

The LDAP Server will support all the user, roles and access rights management.

## **2.3 Software and technologies used**

The Ship database uses the following software and technologies:

- JSF framework
- Java Web Services Developer Pack (Java WSDP)
- Simple Object Access Protocol (SOAP)
- Oracle 12c
- Weblogic 12c
- LDAP (connecting to EMSA's OpenLDAP)
- SSL (transparent to application, SSL is terminated in EMSA's F5)

## **2.4 Environments**

There are currently two separated environments for the LRIT Ship DB

- Test
- Production

Pre-production environment will be deployed later this year.

## **2.5 Physical Diagram**

The following figure represents the physical diagram for the LRITDB application.

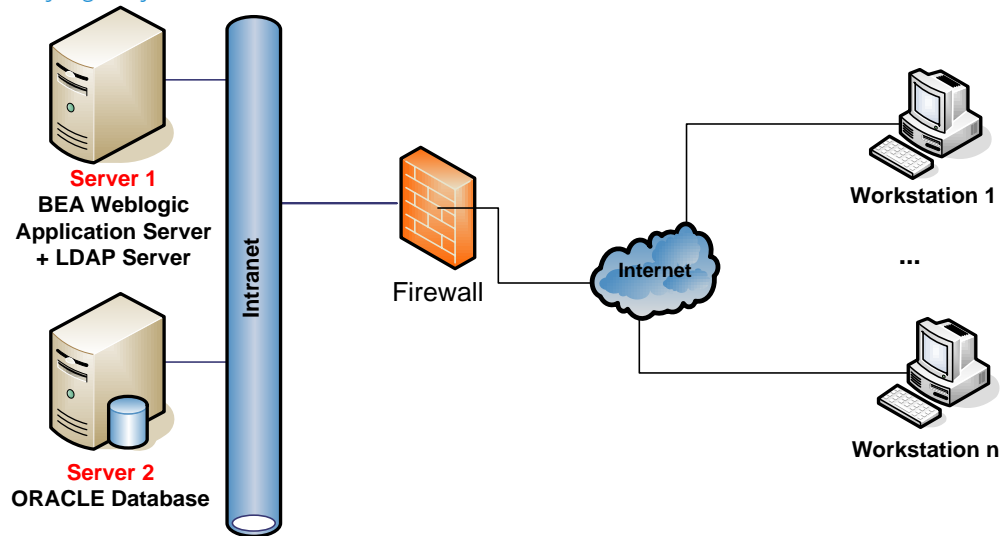


Figure2: The LRIT SHIP DB Physical diagram

## 2.6 Web interface Screenshots

The following figures show screenshots of the Ship database Web interface.

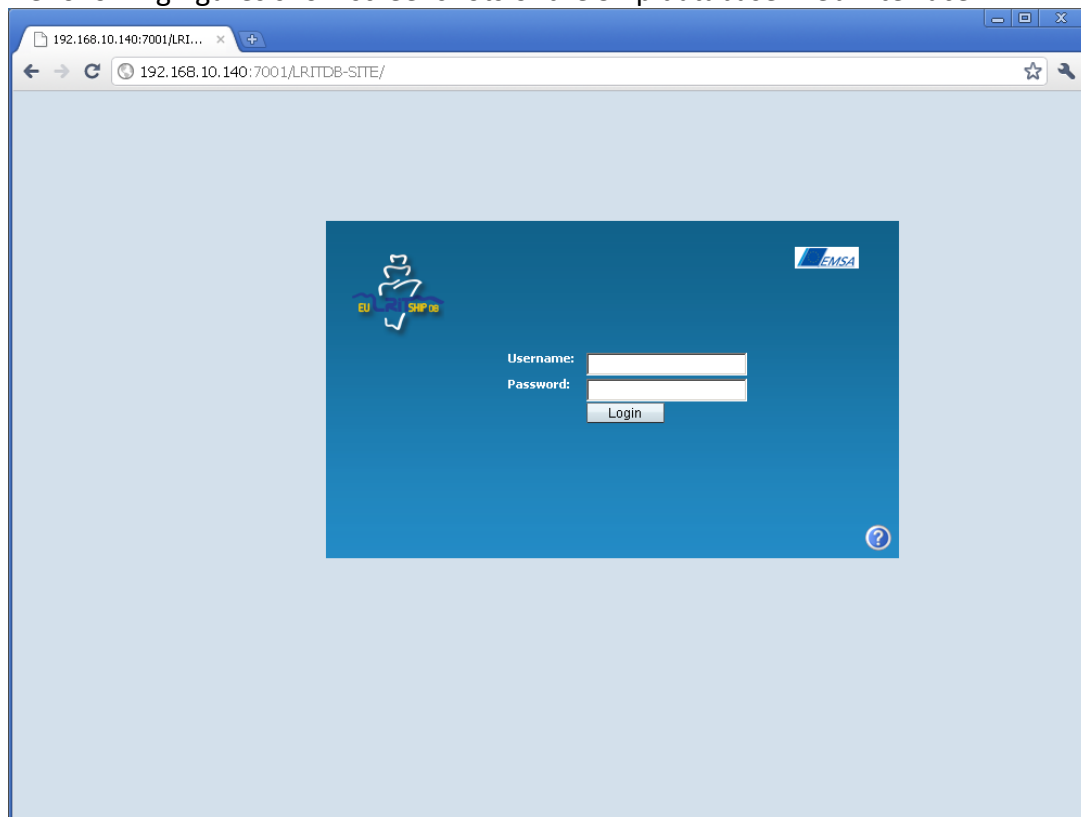


Figure 3: The Login screen



EU LRIT  
Ship Database

Welcome: **lritdb (PT)** | Environment: **Test** | Version: **1.3.2** | [Logout](#)

Daily Cut-off Time: **14:39 UTC**  
Current Date & Time: **2011/04/26 14:50:47 UTC**

**Home**

**Manage Users**

[Search/Update Users](#)

[Create User](#)

[My Profile](#)

**Manage Ships**

[Search/Update Ships](#)

[Search/Update Pre-Registered Ships](#)

**Reporting**

[Ship history](#)

[List of Users](#)

[Activity Log](#)

[Ship DB Version History](#)

**System**

[Settings](#)

[Alerts](#)

**Reference Data**

[Countries](#)

[Communication system](#)

[SSN Web Services](#)

[SSN Web Services](#)

[ASP](#)

[MID](#)

[Call Sign](#)

[Terminal models](#)

**SSN Notification**

[Send Notifications](#)

**EU LRIT SHIP DB**

**EU LRIT DB Information:**

The LRIT DB Application displays a vertical bar in the left hand side of the screen with links to the various functionalities and a horizontal bar in the top part of the screen with a set of information which is always visible. The logged user, the environment, the version of the LRIT DB Application, the Logout button, the daily cut off time and the current date and time.

**Statistics:**

Statistic	Value
Current version of the EU LRIT List of Ships	92.00
Registered users	34
Ships currently registered	8839
Ships going out of service at next cut-off time	0
Ships going to change flag at next cut-off time	0
Ships going to be registered at next cut-off time:	0 new, 0 change of flag
Updated ships since last cut-off time	1

**Alerts (last 3 alert messages):**

Automatic Update - Create Ship - Automatic Update - Ship update request received from bhr\_na\_sys\_update...

Ship deleted - Ship IMO: 7909932/BHRShip has been successfully deleted

ASP/DC exceeds the maximum permitted updates - The ASP/DC interface received a number of update request...

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Figure 4: The Home screen





EU LRIT  
Ship Database

Welcome: **Intdb (PT)** | Environment: **Test** | Version: **1.3.1** | Logout

Daily Cut-off Time: **10:58 UTC**  
Current Date & Time: **2011/03/22 18:01:51 UTC**

Home

**Manage Users**

Search/Update Users

Create User

My Profile

**Manage Ships**

[Search/Update Ships](#)

Search/Update Pre-Registered Ships

**Reporting**

Ship history

List of Users

Activity Log

Ship DB Version History

**System**

Settings

Alerts

**Reference Data**

Countries

Communication system

Notification Web Services

ASP

MID

Call Sign

Terminal models

Search/Update Ships

IMO Number:

MMSI Number:

Call Sign:

Flag State:

Ship Name:

Status:

Communication system:

8,817 items found, displaying 1 to 8.

[First] [Prev] 1, 2, 3, 4, 5, 6, 7, 8 [Next] [Last]

IMO	MMSI	Call Sign	Ship Name	Communication system	Previous Flag	Current Flag	Next Flag	Status
9999981	255383422	CTTTL	Benfica2012	INMARSAT C/mini C	None (new ship)	Portugal		Active
9856323	408008327	A9G8252	Rubin BHR	INMARSAT C/mini C	None (new ship)	Bahrain		Active
9599341	248788000	9HA2515	SVL PRIDE	INMARSAT C/mini C	None (new ship)	Malta		Active
9599250	225005960	EAAL	GIGANTE	INMARSAT C/mini C	None (new ship)	Spain		Active
9594339	378314000	ZJL8390	MY LENA	INMARSAT C/mini C	None (new ship)	British Virgin Islands		Active
9594030	248618000	9HA2440	EXUMA	INMARSAT C/mini C	None (new ship)	Malta		Active
9591765	247303100	ICQA	MBA ROSARIA	INMARSAT C/mini C	None (new ship)	Italy		Active
9591569	246743000	PCFH	COASTAL VANGUARD	INMARSAT C/mini C	None (new ship)	Netherlands		Active

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Figure 5: The Search/Update Ships screen


**EMSA**

EU LRIT  
Ship Database

Welcome: **GUIDAVI (EU)**

Environment: **Test**

Version: **02.00.00** | Logout

Daily Cut-off Time: **14:03 UTC**  
Current Date & Time: **2016/08/09 08:38:02 UTC**

Home
Manage Users
Search/Update Users
Create User
My Profile
Manage Ships
Search/Update Ships
Search/Update Pre-Registered Ships
Reporting
Ship history
List of Users
Activity Log
Ship DB Version History
System
Settings
Alerts
Reference Data
Countries
Communication system
Notification Web Services
SSN Web Services
ASP
MID
Call Sign
Terminal models
SSN Notification
Send Notifications

Ship Details

Changed by: **IS\_SDB1**      on: **2016-07-11 15:19:13**

Ship Identification:

IMO Number: 9998080  
MMSI Number: 251470100  
Call Sign: TFPF  
Ship Type: Tanker  
Ship Name: ūteŌsteā  
Flag State: Iceland

LRIT Radio Equipment:

Communication system: INMARSAT IsatM2M  
Terminal model: OCEAN ALERT  
Serial number: 123456789  
Radio identifier: 1654  
\*LRIT Mandatory: Yes

Contact Person:

Name: TESTE CT  
Address: RUA XCPTO  
Phone No.1: 31564615616156  
Phone No.2: 6156161561561  
Fax Number:  
Email No.1: teste@teste.pt  
Email No.2: bbb123@teeste.pt

Automatic Alert Service (AAS):

Activate the AAS system: No

Transfer of Flag:

Previous Flag: None (new ship)      Next Tranfer Date: -      Next Flag: Unknown

Out of Service:

Date: -

Start of Service:

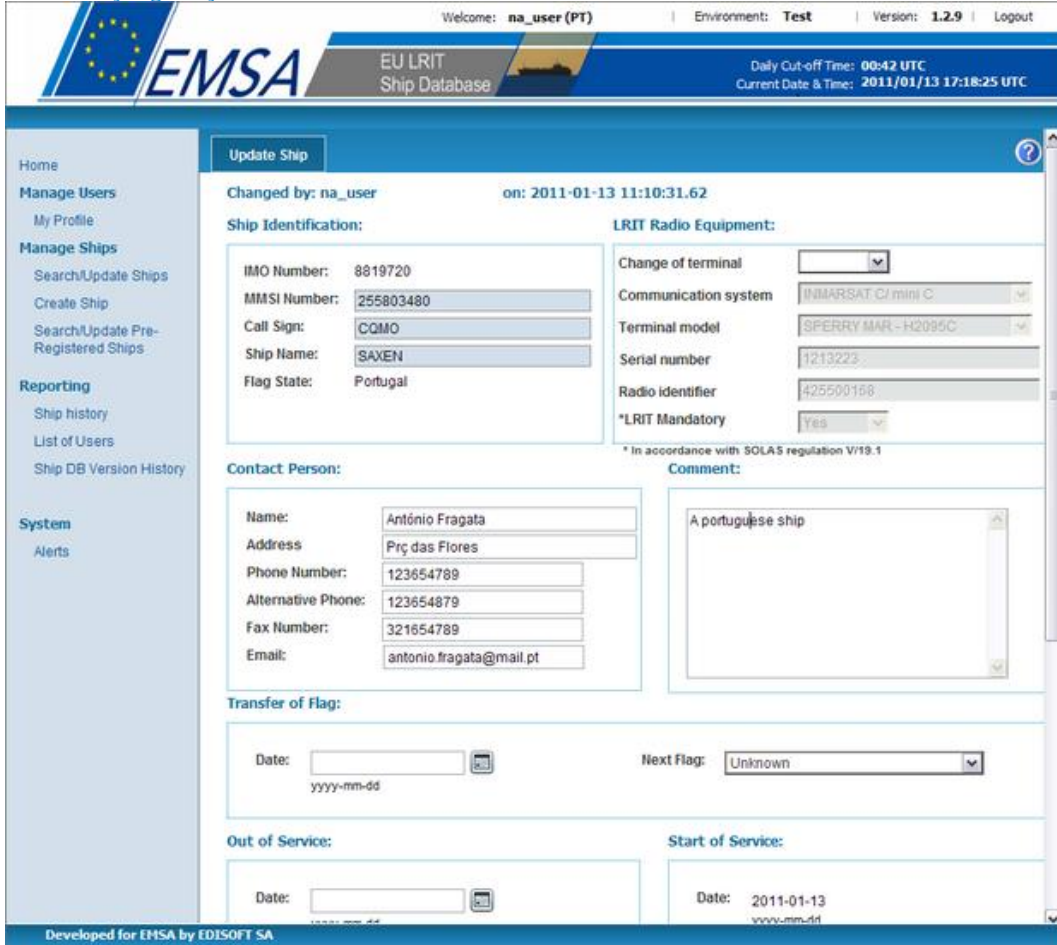
Date: 2016-07-11  
yyyy-mm-dd

Shipborne equipment Type approval:

Type approved by the Administration: Yes    Type approval Reference number: sdfdsf54651sdf  
Certified by the Administration Conformance test report issued by the ASP:-  
Date of issue: -  
  
Shipborne equipment should be of a Type approved by the Administration or Certified by the Administration completing a Conformance Test as stated by IMO MSC.1 Circ. 1307

Back      History

Figure 6: The Ship Details screen



Welcome: **na\_user (PT)** | Environment: **Test** | Version: **1.2.9** | Logout

**EMSA** EU LRIT Ship Database

Daily Cut-off Time: **00:42 UTC**  
Current Date & Time: **2011/01/13 17:18:25 UTC**

**Update Ship**

Changed by: **na\_user** on: **2011-01-13 11:10:31.62**

**Ship Identification:**

IMO Number: **8819720**  
MMSI Number: **255803480**  
Call Sign: **CQMO**  
Ship Name: **SAXEN**  
Flag State: **Portugal**

**LRIT Radio Equipment:**

Change of terminal: **[Dropdown]**  
Communication system: **INMARSAT C/mini C**  
Terminal model: **SPERRY MAR - H2095C**  
Serial number: **1213223**  
Radio identifier: **425500168**  
\*LRIT Mandatory: **Yes**

\* In accordance with SOLAS regulation V/19.1

**Contact Person:**

Name: **António Fragata**  
Address: **Prç das Flores**  
Phone Number: **123654789**  
Alternative Phone: **123654879**  
Fax Number: **321654789**  
Email: **antonio.fragata@mail.pt**

**Comment:**

**A portuguese ship**

**Transfer of Flag:**

Date: **[Calendar]** (yyyy-mm-dd) | Next Flag: **Unknown** [Dropdown]

**Out of Service:**

Date: **[Calendar]** (yyyy-mm-dd)

**Start of Service:**

Date: **2011-01-13** (yyyy-mm-dd)

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Figure 7: The Update Ship screen

## 3 Central Country Database

### 3.1 Overview

The Central Country Database (CCD) is a component of the EMSA Central Databases. It allows storing information about Countries and associated ISO codes, MID and Call Signs.

Other Maritime applications have the possibility to retrieve country information and the associated ISO codes, MID and Call Signs from the CCD. The CCD also allows Human Users to view the Country information through a User web interface.

### 3.2 Design

A central database stores reference information that is shared by several applications in the Agency. A central database can be seen as a directory that uniquely identifies information items by means of a "key". Applications using the same key can refer to the same item without any ambiguity. CCD is such a central database.

As a general rule, only attributes that are significant to two or more EMSA applications should be stored in the CCB.

The CCD is the database used by EMSA to identify in a common and unique manner “countries, dependencies, and other areas of particular geopolitical interest” ([www.iso.org](http://www.iso.org)). In addition to the countries and territories as defined by ISO, the CCD includes also the so called Virtual Countries, Regional Agreements and International Organizations, e.g. “Installations in international waters”, “Bonn Agreements”, “UN”, etc.

For sake of simplicity an item stored in the CCD is named with the generic term “country”.

The CCD follows the ISO-3166 standard to refer to the countries used by EMSA Applications. In case of an update of the ISO-3166 country codes, the CCD is manually updated accordingly. An overview of the ISO standard and the list of codes can be found here: [http://en.wikipedia.org/wiki/ISO\\_3166-1](http://en.wikipedia.org/wiki/ISO_3166-1).

The Country Base Registry allows a 2-level structure to represent the case of territories that are linked to a parent country.

As an example, the Netherlands are the parent country of Aruba (see Figure 5 Country hierarchy).

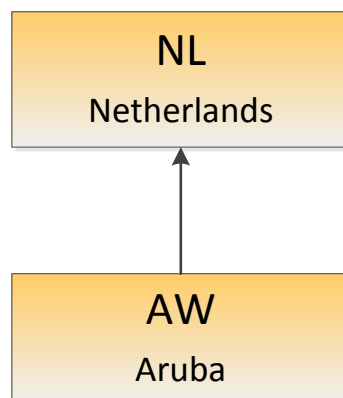


Figure 5 Country hierarchy

A country has the following attributes as defined in ISO-3166 (underlined attributes are unique keys in the list of countries, bold attributes are mandatory):

- **Alpha-2 code (primary key)**
- **Alpha-3 code**
- **Numeric code**
- ISO English country name
- Parent country (alpha-2 code)
- List of associated MIDs
- List of associated radio CallSign prefixes
- Flag image (graphic)

- **Flag State (boolean)**
- **EU member (boolean)**
- **Regional Agreement (boolean)**
- **Virtual Country (boolean)**
- LRIT ID

The example of Netherlands/Aruba is shown below (main fields only).

ISO English country name	Alpha-2 code	Alpha-3 code	Numeric code	Parent country	MID	CallSign prefix	LRIT ID
Netherlands	NL	NLD	528	null	245, 246, 244	PB, PI, PH, PG, PF, PE, PD, PC, PA	1101
Aruba	AW	ABW	533	NL	307	P4	1205

The CCD foresees the possibility to include additional attributes in the future.

In addition to the “officially assigned codes” EMSA uses the reserved or user-assigned codes to identify the European Union.

ISO English country name	Alpha-2 code	Alpha-3 code	Numeric code	Parent country	MID	CallSign
European Union	EU	XEU	900	null	null	null

### 3.3 Software and technologies used

The CCD is developed using the following technologies:

- Simple Object Access Protocol (SOAP)
- eXtensible Markup Language (XML)
- Java Architecture for XML Binding (JAXB)
- Java API for XML Web Services (JAX-WS)

The CCD is developed using the following software:

- Microsoft Window 7 OS
- Liferay Portal 5.2 SP5
- Oracle Service Bus 11.1.1.3 on Oracle Weblogic 10.3.3.0
- Oracle weblogic 10.3.6 as the CCB Application Server
- Oracle weblogic 10.3.3.0 as the ShipDB Application server

- NetBeans 6.9.1 for the Development of the ShipDB module.
- Oracle JDeveloper 11g 11.1.1.6.0 for the development of the OSB services and Liferay Portlets

### **3.4 Architecture and Detailed Design**

See Appendix **App C.2.2 to TS - CCD (previously called CCBR)-Architecture Design Document v1.0**