

EMSA – European Maritime Safety Agency
Unit C.4 – Digitalisation and Application Development

Appendix C.4

LRIT Consumption Tool

Technical Overview

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1 Introduction

This document gives an overview of the EU LRIT Consumption Tool (LCT). The LCT has been operational since June 2014 and EMSA hosts and operates it since then.

2 LCT Overview

The LRIT Consumption Tool (LCT) is part of the group of LRIT Systems (EU CDC, Ship DB and IDE) which are hosted at EMSA and provide services to the LRIT user communities.

The role of the LCT is to support LRIT financial operations with the customers and suppliers of the EU CDC. EMSA, as the operator of the EU CDC, buys and sells LRIT information from/to the:

- EU CDC Participating States, i.e. EU Member States, Norway and Iceland, overseas territories and third countries;
- EU CDC Application Service Provider (ASP) ;
- Other LRIT Data Centres i.e. USA, Canada, etc.

The LCT interfaces with the EU CDC to read the LRIT data flows and to identify financial transactions. A financial transaction is recorded in the LCT by associating a message from the EU CDC to a particular billable item, a particular price and a particular customer or supplier.

The LCT includes the following main functionalities modules:

- Internal Administration (customer/supplier management and price management);
- Rating and charging process;
- Consumption calculation;
- Supplier consumption verification;
- LRIT consumption portal for EMSA financial operators;
- Overall statistical reports; and
- Support to operations.

3 LCT Architecture

The LRIT Consumption tool even if part of the DC architecture is running on a dedicated machine as illustrated by the following system architecture diagram:

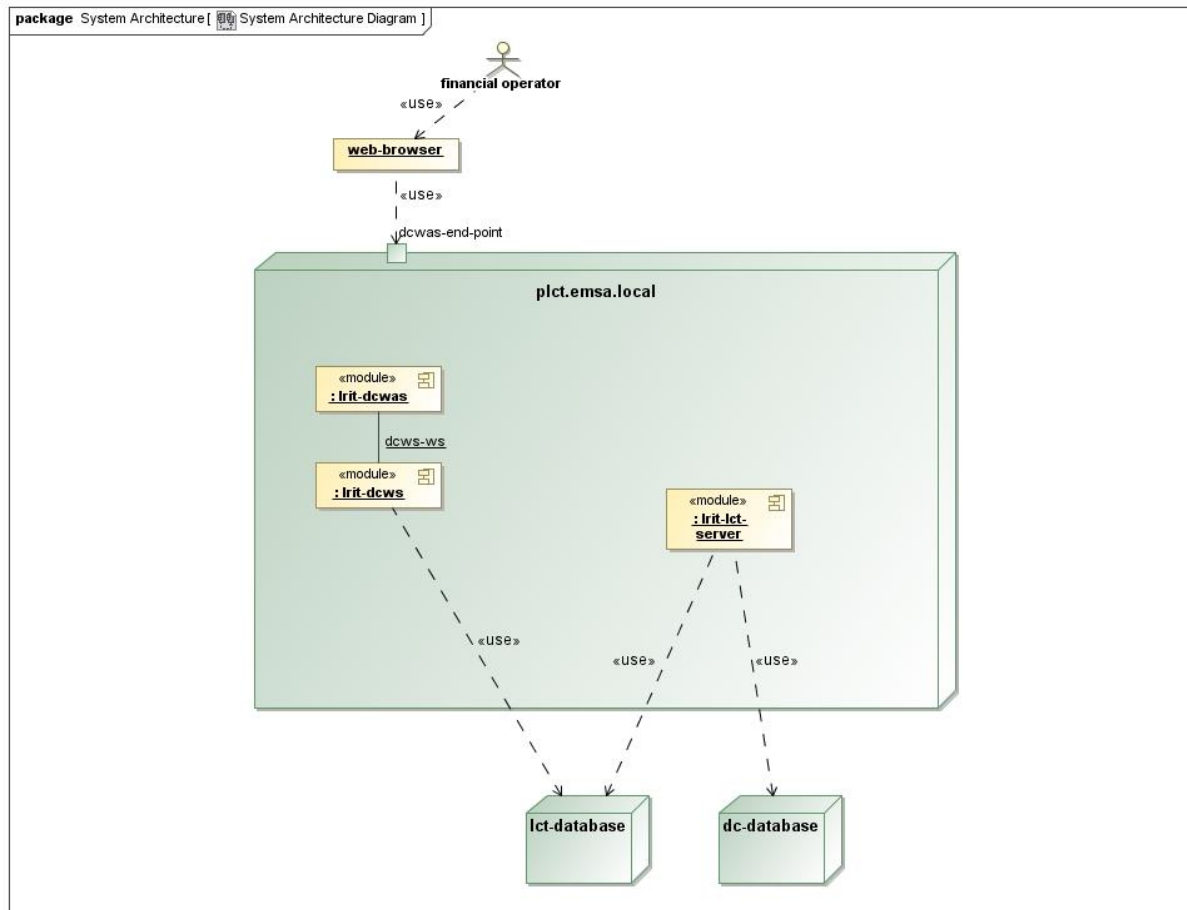


Figure 1 – System architecture diagram

The following figure presents the software architecture of the LRIT Consumption tool:

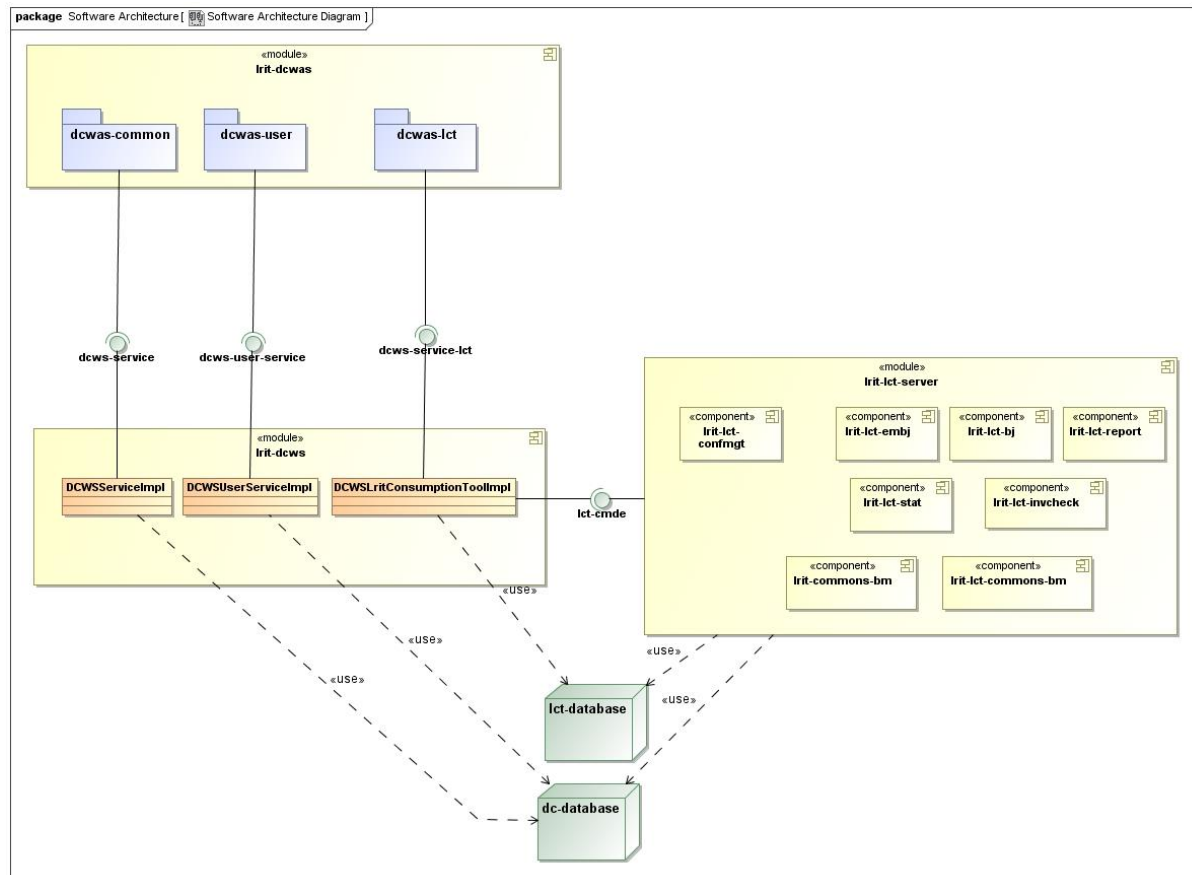


Figure 2: Software architecture

The LRIT Consumption tool is composed of 3 main modules:

- lct-server: the server in charge of handling all the processing tasks.
- dcws: the web service in charge of serving the WUI requests.
- dcwas: the Web User Interface

The lct-server is a software module used only for LCT. Dcws and dcwas are software modules shared with the DC. The LCT and DC use different parts of those modules (except for the common layer), as the screens and the requests are different between the DC and the LCT. Although these modules are shared, the deployment is performed on dedicated instances, one for the LCT and another for DC. This allows decoupling the LRIT Consumption tool from the DC.

3.1 Module description

3.1.1 lct-server

The lct-server is a daemon process responsible of handling all the tasks of the LRIT Consumption tools:

- daily generation of the exchange billing journal

- daily generation of the billing journal
- generation of the schedule or the on demand consumption reports
- update of the overall statistics data
- management of the customer consumption report next_invoicing_day
- generation of on demand supplier invoice verification report

The lct-server module is using 2 databases:

- dc-database: the DC database to extract the information necessary to generate the exchange billing journal. This extraction is only done once a day, and should take a few minutes.
- lct-database: the LRIT Consumption tool database in which is stored all the data used by the LRIT Consumption tool. See the paragraph **Error! Reference source not found. Error! Reference source not found.** to have a description of the structure of this database.

From a deployment point of view, these 2 databases could be hosted in the same database in separated schemas.

The lct-server is controlled by the lct-cmde interface used by the module dcws to send command/request to the lct-server to take in charge the actions done by the financial operator.

3.1.2 dcws

dcws is a web service used by the WUI (dcwas) allowing the access to all the data necessary to the LRIT Consumption tool portal and allowing to control the LRIT Consumption tool for updating the configuration, managing consumption report tasks, requesting on demand consumption reports, on demand supplier invoice verification report, ...

dcws is the same software module as the one used by the DC, in which operations have been added to handle the LRIT Consumption tool dedicated requests.

3.1.3 dcwas

dcwas is the WUI. As for dcws, the same dcwas module as the one used by the DC is used. Some screens will be added (dcwas-lct part) to provide the LRIT Consumption tool portal. The other parts (dcwas-common and dcwas-user) will be simply to control the user access and for the main menu.

A description of the WUI of the Consumption tool is given in section 4 – User Inter**Error! Reference source not found.**

3.2 Software components

The LRIT Consumption tool is built around a set of software components. The following diagram gives the dependency hierarchy of these software components:

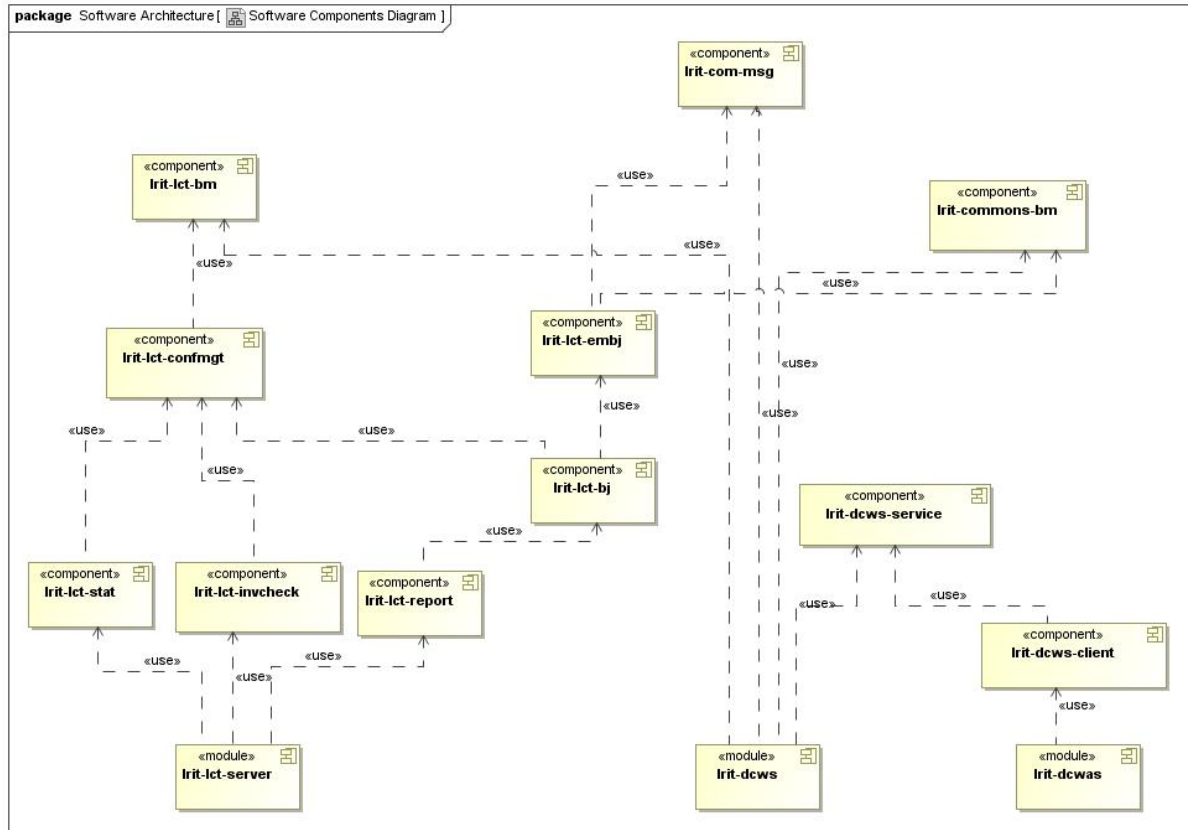


Figure 3 - Software components diagram

The “use” relation means that a software component is depending on one or several other software components. The “root” software components, Irit-ict-server, Irit-dcws and Irit-dcwas correspond to the 3 modules of the LRIT Consumption tool. Each software component is a java project corresponding to a maven artefact.

The following table give a description of each software component.

Software component	Description
Irit-com-msg	XML message schema definition, corresponding JAXB java objects and JAXB marshallers and unmarshallers.
Irit-ict-bm	Database data model dedicated to the LRIT Consumption tool, including data objects and dao. This database software layer is based on hibernate. The data objects are generated from a hibernate mapping file.
Irit-commons-bm	Database data model of the DC, including data objects and dao. This database software layer is based on hibernate. The data objects are generated from a hibernate mapping file.
Irit-ict-confmgt	Configuration management of the LRIT Consumption tool.
Irit-ict-embj	Exchanged message billing journal generation and retrieving. The exchanged message billing journal is generated by extracting the required information from the DC database. The exchanged message billing journal is stored in the LRIT

	Consumption tool database. Each entry of this journal is composed of a timestamp of the corresponding exchanged message and an XML representation of the exchanged message plus the referenced exchanged message if it exists, plus extra information.
Irit-lct-bj	<p>Billing journal generation and retrieving.</p> <p>The billing journal generation corresponds to the rating and charging process. The billing journal is generated by taking the entries of the exchanged message billing journal and applying the billing rules. An entry of the billing journal is a billable transaction, typed by a billable item code and a list of valued prices (see Error! Reference source not found.)</p> <p>The billing journal retrieved is used to generate the consumption reports.</p>
Irit-lct-report	Consumption report generation according to scheduled tasks or on demand generation. The scheduled tasks are built from the consumption report requests which allow setup the periodicity, the customers or the suppliers and the start/end date.
Irit-lct-stat	Daily statistics generation. These statistics are stored in the database allowing a quick access from Irit-dcws to present them in Irit-dcwas.
Irit-lct-invcheck	Invoice checking.
Irit-lct-server	Module LRIT Consumption tool server.
Irit-dcws-service	Definition of the web service exposed by Irit-dcws and used by Irit-dcwas. This web service is composed of operations allowing controlling all the facilities of LRIT Consumption tool from the portal.
Irit-dcws	Web service implementation. This software component is shared with the DC. The LRIT Consumption tool facilities are separated from the DC facilities in dedicated java classes.
Irit-dcws-client	Artifact defining the java client of the Irit-dcws-service. This client is used by Irit-dcwas.
Irit-dcwas	<p>LRIT Consumption tool WUI. This software component is shared with the DC. The LRIT Consumption tool facilities are separated from the DC facilities in dedicated java classes and dedicated javascript files.</p> <p>This software component is composed of a WAR application hosted in a tomcat servlet engine.</p>

3.3 DC interaction

From a runtime point of view the interaction between the LRIT Consumption tool and the LRIT DC is limited by the access to the DC database once a day for generating the exchanged message billing journal and the reading of the DDP information. This process will take a few minutes and will replace the actual billing journal generation. More information on which DC tables are used by the LCT is available in §3.4.1. From a software component point of view, only Irit-dcwas and Irit-dcws are shared between the LRIT Consumption tool and the LRIT DC. Even if these software components are shared, the LRIT Consumption tool will use dedicated menu and screens. This will reduce significantly the risk of regression anomalies.

3.4 External interfaces description

3.4.1 DC interfaces

Interfaces with the LRIT DC:

- I_DC_EXM_BIL_JOUR: the interface to extract the information to generate the exchanged billing journal. This interface consists in accessing in read only to some tables of the LRIT DC database (EXCHANGED_MESSAGE,,). Refer to **\$Error! Reference source not found.** for more information.
- I_DC_DDP_INFO: the interface to retrieve DDP information in order to automatically create new member states and new ODCs. This interface consists in accessing in read only to some tables of the LRIT DC database (DATA_CENTRE, CONTRACTING_GOVERNMENT, ..., to be completed). Refer to **\$Error! Reference source not found.** for more information.
- Read/Write on USER_ACTIVITIES table. The user activities (Web services call) from LCT are logged in the same DC database table than other LRIT user activities. Refer to **\$Error! Reference source not found.** for more information.
- Read/write on USER_PREFERENCES. To register preference on the display. Refer to **\$Error! Reference source not found.** for more information.

3.4.2 IDE journal interface

This interface allows retrieving IDE journal information. It is a csv file providing the following information:

- Journal ID
- Journalled By
- Message ID
- Message Type
- Originator Data Centre Originator Data User
- Destination Data Centre
- Destination Data User Reference Message ID
- Receive Time
- Send Start Time
- Send Time
- TestIndicator
- SAR Indicator
- Delivered
- Delivery Notes
- Deliveries Retries

3.4.3 Supplier invoice journal

This interface allows retrieving Supplier journal information. It is a csv file providing the following information:

- messageID
- RefID
- MessageType
- TimeStamp
- IMONum
- VesselName
- CGRequester
- CGProvider

3.5 User Web Interface

The user interface of the LRIT Consumption Tool will be integrated in dcwas. The new option menu "Consumption" will be added and it is displayed only for the users with the access right "LCT_ADMINISTRATION" or "LCT_OPERATION". The access right "LCT_ADMINISTRATION" gives access to the whole LCT UWI, the access right "LCT_OPERATION" gives access to the whole LCT UWI except the menu "Billing Journal".

Independently of a user having or not the access right "LCT_ADMINISTRATION" or "LCT_OPERATION", the option menu "Consumption" will be hidden if the property "lct" on a configuration file is set to false or does not exist.

The menu "Consumption" will be composed of this options:

- Customer/Supplier Management
- Price Management
- Billing Journal
 - Generation
 - Statistics
- Consumption Calculation
- Overall Statistical Report
- Support to Operations
 - Invoicing
 - Supplier Invoice Verification
- User activities

The Appendix: **App C.4.2 to TS - LCT-UserInterface** describes the screens corresponding to these menus.

3.6 Technologies used

The following software technologies are used in the LCT system:

- **Operating system:** Red Hat Enterprise Linux 6.4
- **Database:** the LRIT DC system is using Oracle 11g (v11.2.0.4) database – upgrading to Oracle 12c. All the sub-systems written in Java are using the Oracle JDBC drivers and the Hibernate persistence framework.

- **Web Application Server:** The LRIT DC web application is running in the Tomcat 7 JSP and Servlet engine, using JDK 1.6.0_37.
- **SOAP web service and SOAP engine:** the web services of the LRIT DC system are running in the Jetty engine, embedded in the Java application of the corresponding sub-system. The CXF services framework is used to implement the SOAP web service
- **Log4J:** is used by the LRIT DC system to handle log files. It allows an easy configurable way to define the content of log files according to log levels and software components.
- **Web Ajax Framework:** the LRIT DC web interface is built using the Ext JS cross-browser JavaScript framework for rich web apps.
- **Apache Commons:** several Apache commons libraries are used within the LRIT DC (bean-utils, collections, dbcp, logging, pool, io)
- **Custom made:** several Custom made libraries are used by the LRIT LCT

3.7 Environments

The LCT system consists of one application server and a database stored on an Oracle Exadata system.

The application server provides the processing power and do not store any data; aside from some configuration files, all data is stored in the database.

There are 3 separate environments for the LCT:

- Pre-Production: Connected to EU LRIT CDC PRE-PRODUCTION.
- Production (PROD): Connected to EU LRIT CDC PROD and end users.
- Test: Connected to EU LRIT CDC Test.