



EUROPEAN COMMISSION
SEVENTH FRAMEWORK PROGRAMME
SEC-2013.2.4-2
GA No. 607685



Protection Measures for Merchant Ships

Deliverable No.	ProMerc D3.3 (Summary)	
Deliverable Title	Counter Piracy Measures Manual	
Dissemination level	Public	
Written By	Juergen Puritscher (EII) Sergio Funtò (EII)	2015-02-10
Checked by	Huw Davies (FLIR) Carmela Occhipinti (EII)	2015-02-10
Approved by	Huw Davies (FLIR) Carmela Occhipinti (EII)	2015-02-10
Status	Final 1.1	2015-02-10

SEC-2013.2.4-2 - Protection Measures for Merchant Ships

Acknowledgement:

The author(s) would like to thank the partners in the project for their valuable comments on previous drafts and for performing the review.

Project partners:

- 1 – FLIR – FLIR Systems LTD - EN
- 2 – CMRE – Nato Science and Technology Organisation - BE
- 3 – WMU – World Maritime University - SE
- 4 – UoA – University of the Aegean-Research Unit - GR
- 5 – SAMI – Security Association for the Maritime Industry Limited - EN
- 6 – UNR – Uniresearch B.V. - NL
- 7 – TNO – Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek - NL
- 8 – EII – Engineering – Ingegneria Informatica Spa - IT
- 9 – Oldendorff – Oldendorff Carriers GMBH & Co KG - DE

Disclaimer:

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 607685.



Executive summary

This document describes one of the planned results of the activity conducted in project WP3, specifically in *Task 3.5 Counter Piracy Measures Manual*, that is based on the *Counter Piracy Knowledge Base*, which outcome has been described by D3.2 at project month 10.

This deliverable D3.3, due at project month 12, is focused on the creation of the PROMERC Counter Piracy Measures Manual to help in the selection and usage of appropriate counter piracy measures in a layered holistic defense providing recommendations on non-lethal piracy counter measures for merchant ships. The Counter Piracy Measures Manual uses the available information coming from the *Counter Piracy Knowledge Base* gets stored in a relational Database, (further on called CPMD) and then classified in a semantic-knowledge base model (further on called ontology). The ontology consists in a model, which is populated from the CPMD with individuals. The single individuals are the available counter measures and products.

The main purpose of the Counter Piracy Measures Manual & Knowledge Base is to make available the gathered project information as following:

1. Interactive Web Application: the available information gets represented by an interactive Web application (further on called IWA), in which end users can enter their criteria online, and then get a list of the available counter measures to use, according to their input criteria above;
2. Counter Piracy Measures Database user interface: the application that allows to create, to populate and then navigate inside the CPMD (further on called CPMD Navigator).

Contents

1.	PROMERC Counter Piracy Measures Manual.....	6
1.1	Background information	6
1.2	PROMERC Counter Piracy Measures Manual interactive application	6
1.2.1	PROMERC Counter Piracy Measures Manual Architecture	7
1.2.2	Technologies and devices used.....	7
2.	PROMERC Counter Piracy Measures Database user interface.....	9
2.1	Background information	9
2.2	PROMERC Counter Piracy Measure Database technical architecture	9
2.3	CPMD Navigator.....	10
	Conclusions.....	13
	Appendixes List.....	15
	Annexes List.....	16
	Acronyms List.....	17

Figures

Figure 1	PROMERC Interactive Counter Piracy Measure Manual - Architecture.....	7
Figure 5	CPMD technical architecture	9
Figure 6	CPMD Navigator login form	11

Tables

Table 2	Annexes List	16
---------	--------------------	----

Introduction

The *Annex 1* of the PROMERC project DOW, in the context of WP3, specifies that the *Task 3.5 Counter Piracy Measures Manual & Knowledge Base* includes the production of a manual (i.e. a knowledge base intended for human use) to help in the selection and usage of appropriate counter piracy measures in a layered holistic defense. It lists the factors and measures with their criteria for end users to read and select appropriate measures for their mission.

This document focuses on the description of the Counter Piracy Measures Manual & Knowledge Base.

The Counter Piracy Measures Manual is an interactive Web Application (IWA) based on the PROMERC ontology created in an earlier phase of *Task 3.5* along with the Counter Piracy Measures Database (CPMD), both described in Deliverable D3.2, issued as planned at month 10.

While the purpose of the PROMERC ontology and the CPMD is to collect, organize and share the managed information and context, as well as to form the basis of the PROMERC Counter Measures Tactical Decision Aid (WP4), the purpose of the Counter Piracy Measures Manual, as defined in task T3.5, is to allow human users to search and use such information. In particular, it allows the user to select the criteria and interrogate the Interactive Manual to find appropriate Counter Measures for the inserted criteria. This is achieved by a deductive reasoning mechanism, which is based on the PROMERC ontology.

The ontology and the CPMD are correlated and based on the same counter measures information. The ontology loads the available Counter Piracy Measures information from the CPMD, which contains also further information needed by WP4 tools (e.g. cost benefit data models and functions, information on the selected scenarios, etc.).

Section 1 of this document explains the approach and the technologies used in order to implement the IWA of the PROMERC Counter Piracy Measure Manual as well as some further information on how it can be configured. In particular, it focuses on:

- How the application can be accessed;
- What is the technical architecture;
- Configuration options for the application;
- How the application can be used;

The Section 2 recalls the architecture of the CPMD (already described in the D3.2) by introducing the technical solutions adopted for the development of the interface application named *CPMD Navigator* that allows the user to configure the database itself.

The document ends with some conclusions on the work done in T3.5 at the current project stage and some considerations for possible future work.

The appendices of this document report following additional information:

- The questionnaire used to collect feedback about the IWA prototype, distributed to the participants of Workshop 02 in Crete, September 2014. Also the summary of the collected results and the improvements performed based on the results are recapitulated there;
- The IWA user guide;
- The CPMD and CPMD Navigator installation instructions;
- The CPMD Navigator user guide.

1. PROMERC Counter Piracy Measures Manual

1.1 Background information

The activity of the production of the Counter Piracy Measures Manual was started during WP1 (*Task 1.1* and *Task 1.2*) and WP2 (*Task 2.1* and *Task 2.2*) and finishes with the conclusion of *Task 3.5*.

Along with the creation of the CPMD the PROMERC ontology model was constructed.

In order to enable the IWA to use the underlying deductive reasoning mechanism, the ontology model must be populated with individuals.

This has to be done at least once using the CPMD. When the ontology model is populated, it is saved by the application in an owl (Web Ontology Language application) file.

Using a configuration file, it is possible to prompt the application to use the populated ontology from a file and avoid having to load it again from the CPMD.

Whenever the content in the CPMD changes i.e. new Products or other CMPs have been added, then the ontology model has to be reloaded from the CPMD. This causes the loaded ontology to be updated.

1.2 PROMERC Counter Piracy Measures Manual interactive application

The WP3 Work package description, Task 3.5 includes the production of a manual (i.e. a knowledge base intended for human use) to help in the selection and use of appropriate counter piracy measures in a layered holistic defense.

The main reasons, why the IWA has been implemented is its ability:

- To take into account the complex multifaceted nature of piracy using deductive reasoning.
- To answer with various numbers of available options in order to mitigate the risk of piracy.

These cannot be achieved by a classical document.

The IWA enables the operator to use the PROMERC Counter Piracy Manual online, to insert determined search criteria and to receive immediately filtered information about:

- Available Counter Measures and Products.
- Counter Measures and Products grouped by PEESLE (social, economic, legal, environmental, political and ethical considerations).
- Ship Assessment – Counter Measures grouped by categories representing an increasing level of counter-piracy protection together the monitory effort.

1.2.1 PROMERC Counter Piracy Measures Manual Architecture

The General Concept of the Counter Piracy Manual’s application implements following concept:

- Data Independence in (Relational) Database and/or owl file loaded runtime
- 3-tier Architecture
- Design Pattern
- MVC Design Pattern (Angular.js)

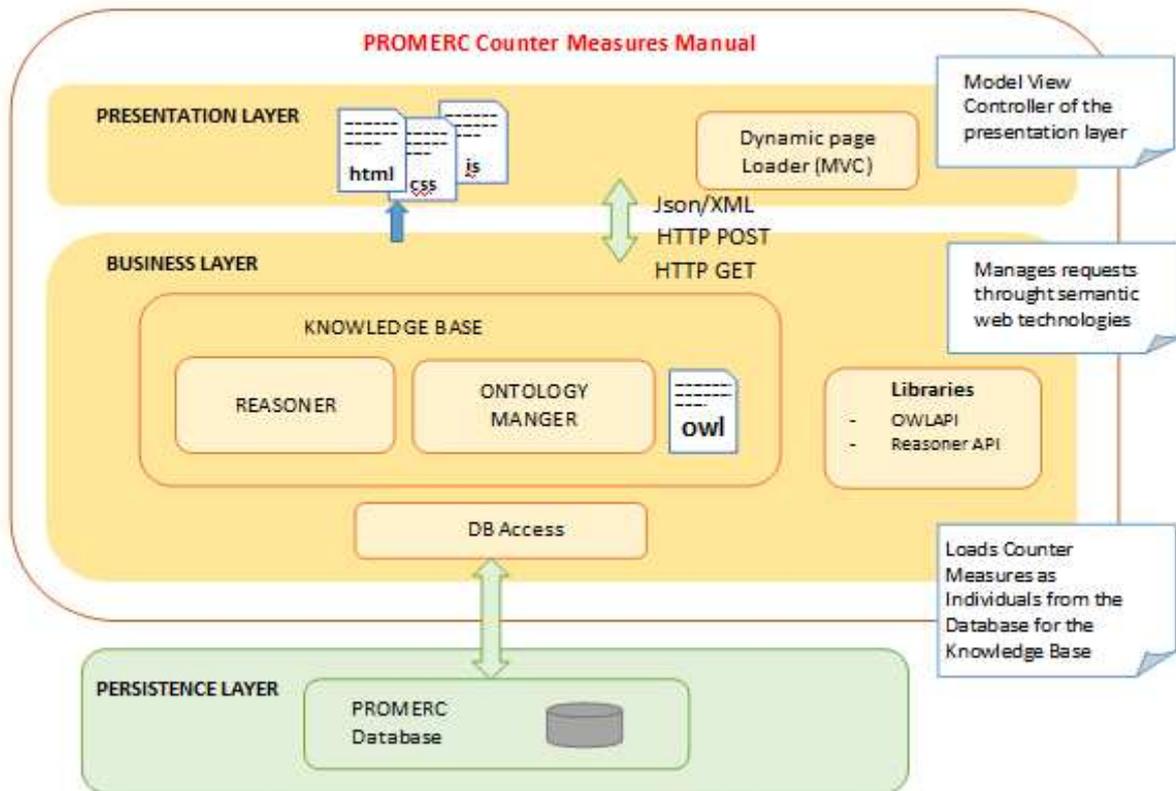


Figure 1 PROMERC Interactive Counter Piracy Measure Manual - Architecture

The Knowledge Base for the Counter Piracy Manuel’s application is represented in an owl (Web Ontology Language) schema and is populated via the database (CPMD) with individuals, which represent all available information about Counter Measures and their object and data properties.

On top of the Knowledge Base, a ‘Reasoner’ is used in order to classify the single individuals.

The deductive reasoning is also responsible, when it is needed, to answer structural queries about the domain and to retrieve requested data.

1.2.2 Technologies and devices used

The IWA for the PROMERC Manual has been designed using the following external tools:

- Application server: Apache-Tomcat: Apache Tomcat is a light open source software implementation of the Java Servlet and Java Server Pages technologies. The Java Servlet and Java Server Pages specifications are developed under the Java Community Process.

Link: <http://www.tomcat.apache.org/>

- Semantic Knowledge Base: owl-api: OWL API is an open-source Java library for the Web Ontology Language (OWL) and RDF(S). The API provides classes and methods to load and save OWL files, to query and manipulate OWL data models, and to perform reasoning based on Description Logic engines. Furthermore, the API is optimized for the implementation of graphical user interfaces.

Link: http://protegewiki.stanford.edu/wiki/ProtegeOWL_API_Programmers_Guide

- Semantic Knowledge Base Design Tool: Protégé: is a free, open-source platform that provides a growing user community with a suite of tools to construct domain models and knowledge-based applications with ontologies. Protégé is a well known ontology editor.

Link: <http://protege.stanford.edu>

- Semantic Knowledge Base Database Tool for ontologies: during the PROMERC project, several already existing database tools to build ontologies directly from relational databases have been tested. It turned out, that the usage of those tools is time expensive. Also already skilled IT specialists must build up particular implicit knowledge, in order to use these tools.

2. PROMERC Counter Piracy Measures Database user interface

2.1 Background information

The activity related to the Counter Piracy Measures Database (CPMD) analysis and design has been started during WP1 (Task 1.1 and Task 1.2) and WP2 (Task 2.1 and Task 2.3) with the identification respectively of the data models related to Counter Measures (CM) - Counter Measure Products (CMP) (Task 1.1) and PEESLE factors (Task 2.1) - PEESLE factors weights with regard to CMP (Task 2.3).

Within WP3, another main contribution to the Counter Piracy Measures Database comes from the Task 3.2, whose main objective is to identify the metric parameters coming from the Task 3.3 outcomes with regard to the Cost Benefit (CB) analysis. Task 3.2 has defined the CB data models to be implemented in the CPMD (Task 3.5) specifically.

The Task 3.2 activity has been integrated with the activity in Task 1.2, Task 3.1 and Task 3.3 with particular reference to the analysis of the CB process (Task 3.1 and Task 3.3) related to the selected scenario (coming from Task 1.2).

Taking into account the Task 3.2 and Task 3.3 outcomes, the initial CMs/CMPs and PEESLE data models have been updated with the integration of the CB parameters identifying also the structures to tie each of the PEESLE factors to each of the CM/CMP.

Task 3.2 outcomes (metrics definition) have been reported in the D3.1 and the activity has been closed with the conclusion of the Task 3.3 (finalization of the CB process).

2.2 PROMERC Counter Piracy Measure Database technical architecture

Following figure synthesizes the technical solutions adopted for the implementation of the CPMD by introducing the technical solutions adopted for the development of the interface application (named *CPMD Navigator*) that allows the user to configure the database contents.

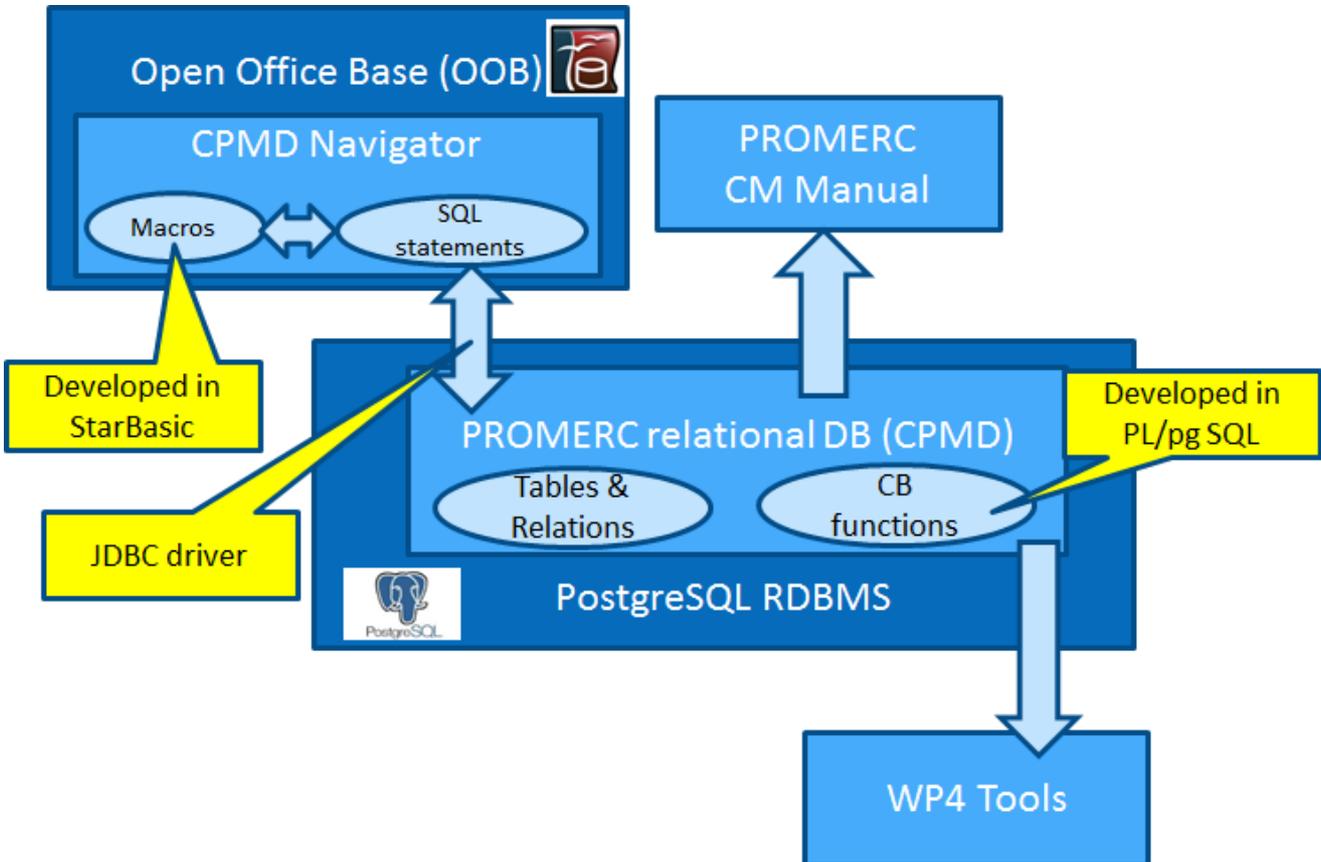


Figure 2 CPMD technical architecture

Adopted RDBMS

As stated in the D3.2, the Relational Database Management System (RDBMS) adopted for the CPMD implementation is PostgreSQL whose characteristics correspond to the main DBMS requirements identified and listed hereafter:

- strong reputation for reliability, data integrity, and correctness;
- availability on all major operating systems;
- support for foreign keys, joins, views, triggers, and stored procedures (in multiple languages);
- native programming interfaces for major languages (C/C++, Java, etc.).

Further information on PostgreSQL is available in the D3.2.

Cost Benefit functions development

The Cost Benefit (CB) functions have been implemented as PostgreSQL stored procedures developed using PL/pgSQL – Procedural Language.

PL/pgSQL is a loadable procedural language for the PostgreSQL database system. The design goals of PL/pgSQL were to create a loadable procedural language that

- can be used to create functions and trigger procedures
- adds control structures to the SQL language
- can perform complex computations
- inherits all user-defined types, functions, and operators
- can be defined to be trusted by the server
- is easy to use.

Further information on PL/pgSQL is available in the D3.2.

Interfaces with the Counter Measures Manual

The interface between CPMD and the CM Manual consist of a set of database *Views* developed in standard SQL that allow the population of the Knowledge Base ontology.

Installation instructions

Detailed CPMD installation instructions are reported in Appendix 3.

2.3 CPMD Navigator

The CPMD user interface, named CPMD Navigator, allows the operator to navigate within the database in order to view, modify and add new information in regards to:

- Counter Measures
- Counter Measures Products
- Counter Measure Vendors
- PEESLE factors
- Ship Types
- Cost Benefit Scenarios
- Relationship between the listed database entities.

Moreover, the CPMD Navigator allows the user to calculate the main CB functions based on the database contents.

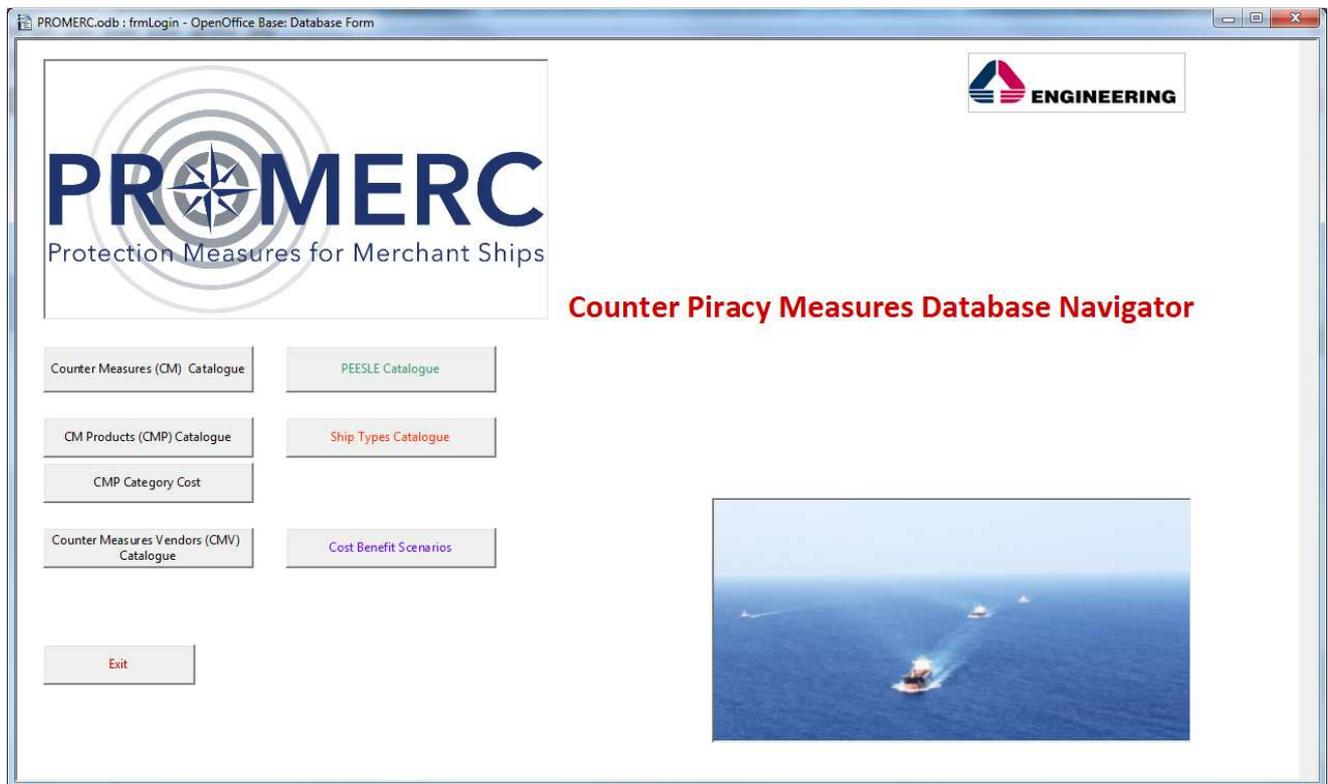


Figure 3 CPMD Navigator login form

Open Office Base

As reported in Figure 2, the CPMD Navigator has been developed using the functionalities of the open source tool *Open Office Base* (named also *Open Base*)

Open Office Base (OOBase) is a desktop database management system, designed to meet the needs of a broad array of users. It offers the full HSQL (HyperSQL) relational database engine, configured for single user, with the data stored right in the Base file, as well as native support for dBase flat files.

OOBase delivers native support drivers for a variety of multi-user database engines and gives support for JDBC and ODBC standard drivers allows to connect to virtually any database.

OOBase is part of the Open Office 4.1.1 suite.

More information on OOBase is available at: <https://www.openoffice.org/product/base.html>.

Interface between CPMD Navigator and the CPMD

The interface between the CPM Navigator (within OOBase) and the CPMD (within PostgreSQL RDBMS) is implemented through a set of SQL queries designed in the OOBase environment that have access to CPMD information by using JDBC driver.

JDBC driver is a software component enabling a Java application to interact with a database.

Further information on PostgreSQL JDBC driver is available at: <http://jdbc.postgresql.org/>

Star Basic

OOBase environment allows the developers to use different type of programming languages to develop the macros (procedures or functions). CPMD Navigator has been developed using Open Office Star Basic.

StarBasic (also known as StarOffice Basic or OpenOffice Basic or OOoBasic) is a dialect of the BASIC programming language that originated with the StarOffice suite and spread through OpenOffice.org and derivatives such as LibreOffice (where it is known as LibreOffice Basic).

The StarBasic programming language has been developed especially for OpenOffice.org and is firmly integrated in the Office package.

The Star Basic programming language can be divided into four components:

- The language: it defines the elementary linguistic constructs, for example, for variable declarations, loops, and functions;
- The runtime library that provides standard functions which have no direct reference to OpenOffice, for example, functions for editing numbers, strings, date values, and files;
- The OpenOffice.org API (Application Programming Interface) that permits access to OpenOffice.org documents and allows these to be created, saved, modified, and printed;
- The Dialog Editor: it creates personal dialog windows and provides scope for the adding of control elements and event handlers;

More information on StarBasic is available at: https://wiki.openoffice.org/wiki/Documentation/BASIC_Guide.

Conclusions

This deliverable summarizes how the expected result of *Task 3.5 Counter Piracy Measures Manual* has been achieved.

It describes how the *Counter Piracy Measures Manual & Knowledge Base* has been implemented. It consists in more components which are:

- The interactive Web application (IWA);
- The Counter Piracy Measure Database (CPMD);
- The CPMD user interface (CPMD Navigator);
- The practical user guides for the IWA and for the CPMD Navigator.

It may be possible, that in the future the data in the CPMD changes. New Counter Measure Products could be added to the CPMD. While the IWA is based on ontology reasoning, and the ontology can be updated via access to the CPMD,

During WP4 work will be undertaken to analyse any requirements for the development of other project tools. It could be useful to create also a tool, which is tailored to insert safely and consistent new Counter Measure Products including their properties into the CPMD in a guided way.

The user/operator, that will use the IWA, has at his disposal accurate data and information regarding counter measures and products by entering the “catalogue” section/tab (see Figure 3 or Figure 4)). This information has been collected during WP1 and is available to the user accessing a simple form where he/she can select different type of criteria such as type of “layered defense category”.

PEESLE’s survey (coming from WP2) is also a source of data for the Manual: in the section/tab “PEESLE” the user can select counter measure products based on the type of impact they have for determined PEESLE factors. This helps the operator to choose the best configuration of counter measures to apply or install by evaluating also social, economic, legal, environmental, political and ethical considerations.

Finally, using results of *D1.3 Operational Effectiveness* weightings and *D3.1 Cost Benefit Analysis* for Counter Measures, a Ship Counter Measure Assessment has been included in the Manual.

Background information: In *D3.1* the concept of ship CMP categories has been introduced. Starting from CAT0, CAT1 and CAT2 up to CAT3, these categories represent an increasing level of counter-piracy protection.

Accessing to the section/tab: Ship Assessment, it is possible to see the CMPs grouped by CMP category, together with the monetary cost needed to reach the next category level.



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 607685.

http://cordis.europa.eu/fp7/cooperation/home_en.html

<http://ec.europa.eu>

Appendixes List

Appendix 1 – Survey about the Interactive Counter Piracy Measures Manual during Workshop 2 (WS02)

Appendix 2 – PROMERC interactive Counter Piracy Measures Manual user guide

Appendix 3 – PROMERC CPMD and CPMD Navigator installation instructions

Appendix 4 – PROMERC CPMD Navigator user guide

Appendix 5 – PROMERC CM Manual (hard copy)

Annexes List

The following table reports the annexes to this document related to the CPMD, CPMD Navigator and CM Manual:

Item	Details	Description
CPMD	PROMERC_dump_20150210.sql	SQL script to create and populate the CPMD on PostgreSQL
CPMD Navigator	PROMERC.odt	Open Office Base file with the CPMD user interface forms
Images	Images folder	Folder with images used by CPMD Navigator
Open Office JDBC	postgresql-9.3-1102.jdbc41.jar	Open Office JDBC driver for PostgreSQL
CM Manual User Guide	PROMERC IWA User Manual_v1.2.docx	CM Manual User Guide of the IWA (See Appendix 2)
CMPD Installation Instructions	WP3-CMPD_Installation_Instructions_EII_v1.1_final.pdf	CMPD Installation Instructions. It includes PostgreSQL and Open Office configurations. (See Appendix 3)
CMPD Navigator User Guide	WP3-CMPD_Navigator_user_guide_EII_v1.1_final.pdf	CMPD Navigator user guide (See Appendix 4)
CM Manual Hard Copy	WP3-CM_Manual_hard_copy_EII_v1.0_final.docx	CM Manual Hard Copy (See Appendix 5)

Table 1 Annexes List

Acronyms List

CM	Counter Measure
CMP	Counter Measure Product
CPMD	Counter Piracy Measures Database
IWA	Interactive Web Application
JDBC	Java Data Base Connectivity
ODBC	Open Data Base Connectivity
OWL	Web Ontology Language
PEESLE	Political Ethical Economic Social Legal Environmental
SQL	Structured Query Language
WP	Work Package