

Software Requirement Specification

Open Source Sustainability Assessment Framework, Format Converter Module

Version 1.1

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1. Scope

1.1 Identification

This document applies to the Open Source Framework currently under development by GreenDeltaTC and collaborating institutions and individuals, and also to the format converter, a module within the framework. The framework will be made available as Open Source Software, the converter as well. Current releases do not yet exist.

1.2 System overview

The Open Source Framework serves to calculate sustainability for products over their whole life cycle, from resource depletion over use to disposal. More specifically, one will be able to assess the environmental impact of any product, according to ISO 14040 standards and also by methods not according to the ISO 14040 standard series. The framework will, in a long term perspective, include several different methods for conducting Life Cycle Assessments of products, and will allow using them in a consistent and efficient manner. Addition of social and economic assessment over the whole life cycle will be foreseen.

The Life Cycle Assessment to be performed within the framework will in the first step consist of product system specification, inventory calculation, and impact assessment according to midpoint LCIA methods.

The converter module has the purpose to convert important Life Cycle Inventory data formats, namely

- the ELCD format;
- the EcoSpold format;
- the ISO@Spine format, and
- the SimaPro software format¹

from one of these formats to the other. The conversion will be performed in an efficient and “loss-less” manner. Loss-less means, in this context, that information provided in one format will be available after conversion to another format in a metadocument that contains all information provided in the source format².

Further data formats may be added in future. Design of the converter module will take these possible extensions into account. The converter module will be available both as a stand alone application and as a module integrated in the framework.

The project was launched by GreenDeltaTC in late 2006 as Open Source Project. External advisors are Dr. Stefan Angenendt, of Ipco, India, and Dipl.-Ing. Jutta Hildenbrand, of University Wuppertal, Germany.

Further external advisors, contributors, and test volunteers, are to be linked with the project in near future.

The project will be supported by a funding consortium that is establishing at present. The funding consortium will have the right, and be requested to, critically discuss this requirement specification document, and influence future versions of it. GreenDeltaTC will moderate the funding consortium.

This software requirement specification document thus is to be seen as a living document, as more refined specifications, and possibly modified specifications in light of project results or other developments and experiences outside of the project, may find entry in the requirement specification for the software.

Specifications may change if they are consensus within the funding consortium and if the implementing party agrees to the change. Any institution or individual that enters the funding

¹ SimaPro software format is the EcoSpold implementation of the SimaPro software, by PRé consultants, Amersfoort, Netherlands; more information is available on www.simapro.com and www.pre.nl.

² Note: Due to recursions in the ELCD format, cut-off rules may be applied. In these cases, the metadocument may not contain all information provided by the ELCD source data set. The user then can, optionally, save the original ELCD data set.

consortium, however, will get at least the software specified in this document in the present version.

The whole project will be managed by GreenDeltaTC in an open and agile manner, supported by a project-own website with filesharing and version control system capability.

1.3 Document overview

This document comprises six sections:

- Scope
- Referenced documents
- Requirements
- Qualification provisions
- Requirements traceability
- Notes

This document may be freely distributed. Changes or modifications, however, are not permitted.

2. Referenced Documents

2.1 Project documents

At present, documents and texts originating in the project and relevant for software requirements specification and with are the project website, <http://greendeltatc.com/index.php?id=187>, and the “Brief Description of the Format Converter Plugin Functionality”. The latter is available on the website.

2.2 Other documents

For the Framework, the following background documents are important:

1. “About the OSGi Service Platform”, Technical Whitepaper, Revision 4.1, 11 November 2005, OSGi Alliance
2. The Eclipse Platform Plug-in Developer Guide, <http://help.eclipse.org/help32/index.jsp>
3. The GNU General Public License, GPL
4. The Mozilla Public License V. 1.1 (MPL 1.1)

5. Ciroth, A., Gerner, K., Ackermann, R., Fleischer, G.: IT-Lösungen für den Bahnkreis – Datenbank- und Softwareentwicklung zur Darstellung der Umweltrelevanz von Schienenfahrzeugen, Handbuch Umweltwissenschaften, Alpha, Lampertheim 2003, pp. 95 – 102.

For the format converter, the following documents are most relevant:

1. Copyright and license conditions for ELCD core data sets, EU Commission, 2007, http://lca.jrc.ec.europa.eu/EPLCA/Doc/ELCD-core-dataset-license_1.o.1.txt
2. Copyright and license conditions for ELCD format and editor, EU Commission, 2007, http://lca.jrc.ec.europa.eu/EPLCA/Doc/ELCD-format-and-editor-license_1.o.1.txt
3. LCA data format for the European Life Cycle Assessment Reference Data System (ELCD), Technical Background Report, 31st August 2005 Marc-Andree Wolf & David W. Pennington, draft
4. LCA data format for the European Life Cycle Assessment Reference Data System (ELCD) Nomenclature and structure, 03rd September 2005, draft
5. Format needs and analysis of existing formats, http://lca.jrc.ec.europa.eu/EPLCA/faq.htm#ELCD_Database:_content,_format
6. ecoinvent 2000 – Documentation EcoSpold, Document version: 1.2, Authors: J. Hedemann, I. Meinshausen, Translation: R. Frischknecht, Release date: 23. April 2003
7. Technical Documentation of the ecoinvent Database Data v1.01 (2003) Jan Hedemann, Uwe König, ifu Hamburg GmbH ecoinvent report No. 4 Dübendorf, December 2003
8. Overview and Methodology Data v1.1 (2004), ecoinvent report No. 1 Dübendorf, June 2004, Rolf Frischknecht, Niels Jungbluth (Editors)
9. Overview and Methodology Data v1.01 (2003) Rolf Frischknecht, Niels Jungbluth (Editors) ESU-services, Uster Hans-Jörg Althaus, Gabor Doka, Roberto Dones, Stefanie Hellweg, Roland Hischer, Thomas Nemecek, Gerald Rebitzer, Michael Spielmann, ecoinvent report No. 1 Dübendorf, December 2003
10. Data definition and file syntax for ISO/TS 14048 data exchange with data storage format based on ISO/TS 14048, RAUL CARLSON, JOHAN TIVANDER, CPM - Centre for Environmental Assessment of Product and Material Systems, CHALMERS UNIVERSITY OF TECHNOLOGY, Göteborg, Sweden 2001, CPM 2001:9
11. Introduction and guide to LCA data documentation using the CPM documentation criteria and the ISO/TS 14048 data documentation format, KAROLINA FLEMSTRÖM, ANN-CHRISTIN PÅLSSON, IMI - Industrial Environmental Informatics for CPM - Centre

for Environmental Assessment of Product and Material Systems, CHALMERS
UNIVERSITY OF TECHNOLOGY, Göteborg, Sweden 2003, CPM Report 2003:3

12. ISO 14048 - Environmental management: Life cycle assessment - Data documentation format, ISO/TS 14048:2002 (E)

2.3 Precedence

A first announcement of the project (“A new Open Source Software for Sustainability Assessment...”) was distributed by GreenDeltaTC by mail as a pdf attachment, 9th of November 2006. In this document, the licence concept is described in a different manner than it will be applied in the project.

This version replaces the first Requirement Specification document, from 22nd of January 2007.

2.4 Source of documents

If source of the documents is not given above they are available on GreenDeltaTC’s website.

3. Requirements

This section is divided into paragraphs to specify the Computer Software Configuration Item (CSCI) requirements, that is, those characteristics of the CSCI that are conditions for its acceptance.

3.1 Required states and modes

/3.1.1/ There are no specific states required for the Framework.

/3.1.2/ The Framework and the format converter module will be designed in a way that the format converter can be started and terminated during runtime of the Framework.

3.2 CSCI capability requirements

/3.2.1/ The Framework will allow specification, calculation and reporting of a Life Cycle Assessment including inventory calculation and impact assessment.

More specifically, the Framework will have the following capabilities

/3.2.1.1/ The product system of the LCA is not limited in size, nor are, in principle, the processes.

/3.2.1.2/ It is possible to display the product system as a network of interlinked processes, and it is also possible to modify the product system via the visually displayed network, and to display calculation results in this network, where relevant.

/3.2.1.3/ For the LCA, the impact assessment will be a midpoint assessment. Several different methods will be foreseen and users will be able to choose among them.

/3.2.1.4/ The framework will allow saving each LCA model and retrieving it from a database.

/3.2.1.5/ Exchanges between processes can be modelled in a recursive manner, one exchange can be part of another exchange. For example, it will be possible to model the COD in water that is emitted from a plant.

/3.2.1.6/ The inventory calculation will be able to cope with loops in the product system.

/3.2.1.6/ Cut-off criteria based on mass or energy can be specified for the LCI calculation and will be taken into account during calculation to determine system boundaries.

/3.2.2/ The Framework will be highly modular and will allow efficient combination of different plugins; plugins can be started and stopped at runtime.

/3.2.3/ The converter will be the first plugin in the framework but will also run as stand alone application with the same conversion capabilities.

/3.2.4/ The converter will allow conversion between important data LCI data formats.

/3.2.4.1/ The converter will allow conversion between the following formats: ELCD, ISO@Spine, EcoSpold, and SimaPro¹, in the version actual at present (22nd of January 2007).

/3.2.4.2/ The conversion will create a metadocument that will store all information provided by the source format.

/3.2.4.3/ A conversion from one format to another format and back to the initial format will consider the metadocument when it exists (the user needs select the “save metadoc” option in the conversion process), and will, by using the metadocument, fill in information not foreseen in the target format of the first conversion process.

/3.2.4.4/ The metadocument can, optionally, be saved and edited by the user.

/3.2.4.5/ Conversion means casting the content provided in one “source” format, at one or several specific locations, to one or several specific locations in the target format.

3.3 CSCI external interface requirements

/3.3.1/ There are no specific external interface requirements for the Framework. The Framework will provide a GUI for interaction with the user.

/3.3.2/ The format converter will be able to read from ISO@Spine, ELCD and EcoSpold XML files as well as from SimaPro¹, and will further be able to write directly to ELCD databases and provide XML files according to the selected target data format.

3.4 CSCI internal interface requirements

/3.4/ The Framework and its modules, including the format converter, will share data and memory based on the OSGI specification. An efficient data exchange will be taken into account in the design phase, supported by the Eclipse IDE that is used for design and implementation. An UML model of the Framework will be created and used for generating Java code from it. The UML model serves to supervise and ease object modelling in the project.

3.5 CSCI internal data requirements

/3.5.1/ The Framework and, where appropriate, its modules, will store data in a MySQL relational database.

/3.5.2/ The format converter will store data in XML files. It will further use XML documents, stylesheets and schemas of ELCD, EcoSpold and ISO @Spine files where necessary for the conversion process.

3.6 Adaptation requirements

/3.6/ No data related adaptation requirements exist both for the Framework and for the converter. Users may, however, import regionally different databases for inventory processes and for impact categories into the database.

3.7 Safety requirements

/3.7.1/ Before being released as stable versions, any parts of the software will be thoroughly tested, and test results will be taken into account in the released versions.

/3.7.2/ Testing and evaluating partners of the project will be provided, in each case, testable versions of release candidates, and will be granted sufficient time for testing.

/3.7.2.1/ A typical “sufficient time” for testing will be two weeks. Necessary time will be coordinated between GreenDeltaTC and testing partners.

/3.7.2.2/ For the converter, tests will include quality checks of the conversion.

3.8 Security and privacy requirements

/3.8.1/ The framework will require users to log in. A user management in the software will at least specify administrators and standard users. Standard users will not be granted all rights. This will allow some areas in the database to retain protected information that is not visible, or not to modify, by standard users.

3.9 CSCI environment requirements

/3.9/ The Framework and the converter will be designed to run in Windows environments (Win 2000, Win XP, Vista), Macintosh, and Linux OS. A Java Virtual Machine (JVM) of version 5 or higher needs to be installed. A MySQL database needs to be installed as well. Both JVM and MySQL will be made available on the website.

3.10 Computer resource requirements

/3.10/ The software will require a modern office computer with keyboard and mouse. Further hardware requirements (memory, hard disc space) will be added in the course of the project.

3.11 Software quality factors

/3.11.1/ The software will perform with consistent, correct results.

/3.11.2/ The software will be easily learned and used. This usability will be supported by documentation accompanying the software.

3.12 Design and implementation constraints

/3.12.2/ The software will be documented in English.

/3.12.3/ The user interface will be in English, too.

3.13 Personnel requirements

/3.13.1/ The software will be designed to be used by people interested in Life Cycle Assessment and sustainability assessment.

/3.13.2/ The range of experience will vary from beginners to professional users.

3.14 Training-related requirements

/3.14/ Wizards will help users getting accustomed to LCA methodology and to using the software.

3.15 Logistics-related requirements

/3.15.1/ The software and parts of the software (modules) will be downloadable on the website, for free, under the GNU General Public License GPL.

/3.15.2/ Member of the funding consortium receive the software, or parts of the software (modules) under the Mozilla Public Licence, MPL 1.1., on a protected section of the website.

/3.15.3/ For a moderate fee, the software and documentation may also be received from GreenDeltaTC on CD or DVD.

/3.15.4/ Contributing and/or testing project partners will be able to upload their contributions and test results on the software website.

3.16 Other requirements

/3.16.1/ The Framework is scheduled to be available in an alpha-version, including database, in summer 2007. This alpha version will be made available for testing purposes; the sources will be available for funding members. A second module, the uncertainty assessment and modelling plug-in, will be designed, coordinated and implemented in winter 2007/2008. The Framework is to be released as beta version in spring 2008, and released as stable first version in summer 2008.

/3.16.1/ The following schedule is required for the format converter: Beta version available end of February 2007, the beta version will be made available to funding members for testing and comments. Release of the first version of the converter will be in spring 2007.

3.17 Packaging requirements

/3.17/ There exist at present no specific packaging requirements.

3.18 Precedence and criticality requirements

/3.18.1/ There is, at present, no hierarchy of the requirements given in this document. In consequence, there is no differentiation between must and nice-to-have criteria.

4. Qualification Provisions

To be determined.

5. Requirements Traceability

Later versions of this Requirement Specification document will be provided on the project website, in a Wiki, together with a change history, and will thus enable tracing requirement modifications.

6. Notes

6.1 Intended use

This Software Requirements specification shall be used to communicate the requirements the Open Source Framework project is committed to.

It is intended to be discussed within a funding consortium, and shall help funding members to better understand benefits of participation, and to match their own expectations and experiences against what is foreseen in the project so far. In this way the requirements specification shall create a common understanding of the various results of the software project, and thus stimulate a refinement of these requirements specification to better and better match user-needed requirements.

The requirements specification shall, further, provide a reliable background document for funding members. Specifically, funding members shall be ensured that the initially specified requirements will be met and that this can be ensured, and checked, during the whole course of the project in a transparent manner, until project finalisation.

6.2 Definitions used in this document

“Software” means, in this document, the Open Source Framework together with the format converter.

“Website” means, in this document, the website of the Open Source Software project, unless noted otherwise.

6.3 Abbreviations used in this document

CSCI: Computer Software Configuration Item

GPL: GNU General Public License

MPL: Mozilla Public Licence

OSGi: Open Services Gateway initiative

6.4 Changes from previous issue

Despite minor changes in formatting and orthography, version 1 and 1.1 of the Requirement Specification differ in the following points:

- SimaPro software format was introduced in version 1.1 as one of the formats to be supported by the format converter, and GaBi software format was removed (section 1.2). Accordingly, requirements 3.2.4.1 and 3.3.2 were changed
- Section 2.3, precedence, was updated
- In section 3.7, Safety requirements, a section on quality control introduced
- In section 5, a way to manage requirements traceability in future versions was added