MELiSSA

TEC-MMG/2011/154/In/BL

MELiSSA template for requirements

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1. Introduction

1.1. Glossary

AD   : Applicable Document
DMS   : Data Management System
IVVQ   : Integration, Verification, Validation, Qualification
LS   : Life Situation
MELiSSA   : Micro-Ecological Life Support System Alternative
RAMS   : Reliability Availability Maintainability Safety
RD   : Reference Document
SE   : Systems Engineering
TBD   : To Be Defined (or To Be Determined)
V&V   : Verification and Validation

1.1. Applicable documents

AD1   Memorandum of Understanding ESTEC 4 000100 293/10/NL/PA
AD2   TNxx. System Engineering applied to the MELiSSA Data Management System. Requirements. SHERPA. TAS activity - October 2011

1.2. Reference documents

This document is confidential property of the MELiSSA partners and shall not be used, duplicated, modified or transmitted without their authorization
Memorandum of Understanding ESTEC 4 000100 293/10/NL/PA

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2. Scope

Overall description of the context of the document. Example: describe the activity, the Work-Package.

2.1. System of interest

Ex: CIII is the system of interest

2.2. Mission of the system

Ex: nitrification, ie to convert nitrogen sources to nitrates in the liquid phase.

2.3. Stakeholders

Indicate the list of the stakeholders:
Like users, operator, maintenance operator, contracting authority, prime contractor, manufacturer, MELiSSA partners…

2.4. Sub-Systems

Identification of the sub-systems if any
Ex : Liquefying Compartment
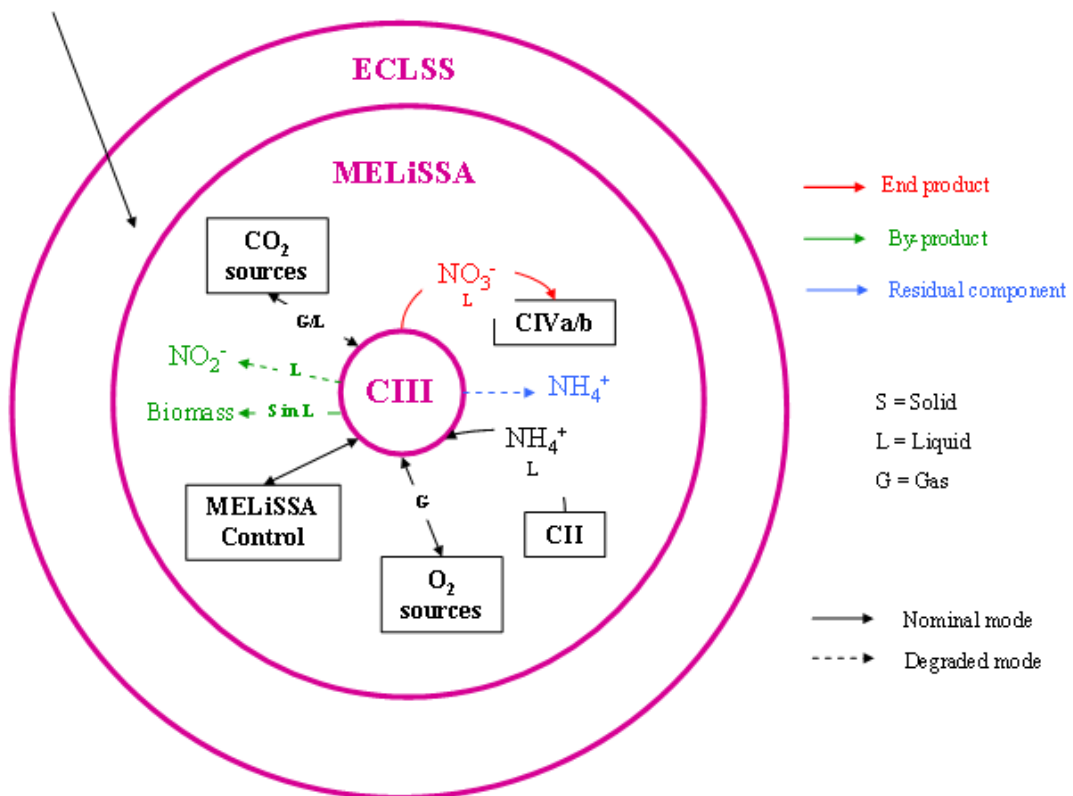Subsystems : Liquid loop, Solid Loop, Gas Loop

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3. Context Diagram

3.1. Context Diagram

Diagram, with the system of interest at the centre. Indicate the perimeter (environment), actors, inputs, outputs and links (arrows) between them. Example:

Space mission = Moon or MARS base (gravitation, radiation, temperature, ...)

Context Diagram – Black Box view

3.2. Actors

3.3. Inputs

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3.4. Outputs

3.5. Life Cycle, Scenario, Use Case

Identification of the considered life cycle phases (conception, development, production, utilization, support, retirement).
For each Life Cycle, identification of the scenario and use case.
Ex:
Utlization life cycle
Scenario 1:
- Start-up
- CV running and not connected to CIVa
- CIVa/CV connected
- …

4. Needs

Needs are expressed only in the User's Requirement specification.
For other specification documents it can be reminded.

For each stakeholder, needs are expressed. For further reference to needs, each need is referenced as **Needs_xxx**

Needs are "Necessity or desire felt by a user". It can be only qualitative. Some constraints can be identified at this level. Each needs will be addressed (translated into requirements) in the requirement chapter.

Example:

CIVa/CV:

Needs_001: Rats in upper or lower compartment must be fed by O2 provided by CIVa. CIVa is connected to CV to treat CO2 and provide O2 to the rats. Comfort of the rats must be handled (T, RH, air composition).

Other stakeholder's needs:

Needs_002: SHERPA: validate the control law

Needs_003: ESA: WP1 demonstration tests

Needs_004: UBP: validation of the knowledge model

Needs_005: UAB: maintainability, reliability, availability, safety

…

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5. Requirements

Remark:
The System requirements express "What to do" and not "How to do". They are expressed in objectives to be reached by the system and system properties. They are, if possible, independent of technology choices to open the scope of possible solutions.
These requirements have to be justified, quantitative and associated with criteria for validation.
They are declined on each system level and take into account all the actors and stakeholders.

5.1. Meta Level

The general rules to respect are defined such as norm, science principles and domain rules. For example the rules of quality ECSS, the veterinary constraints…

Ex:
CV-CON-NORM-001   CV compartment shall respect the veterinary rules xxx

CV-CON-QUAL-001   Requirements shall respect MELiSSA DMS rules
Validation Method : Review (SRR). Criteria: Acceptance of SRR
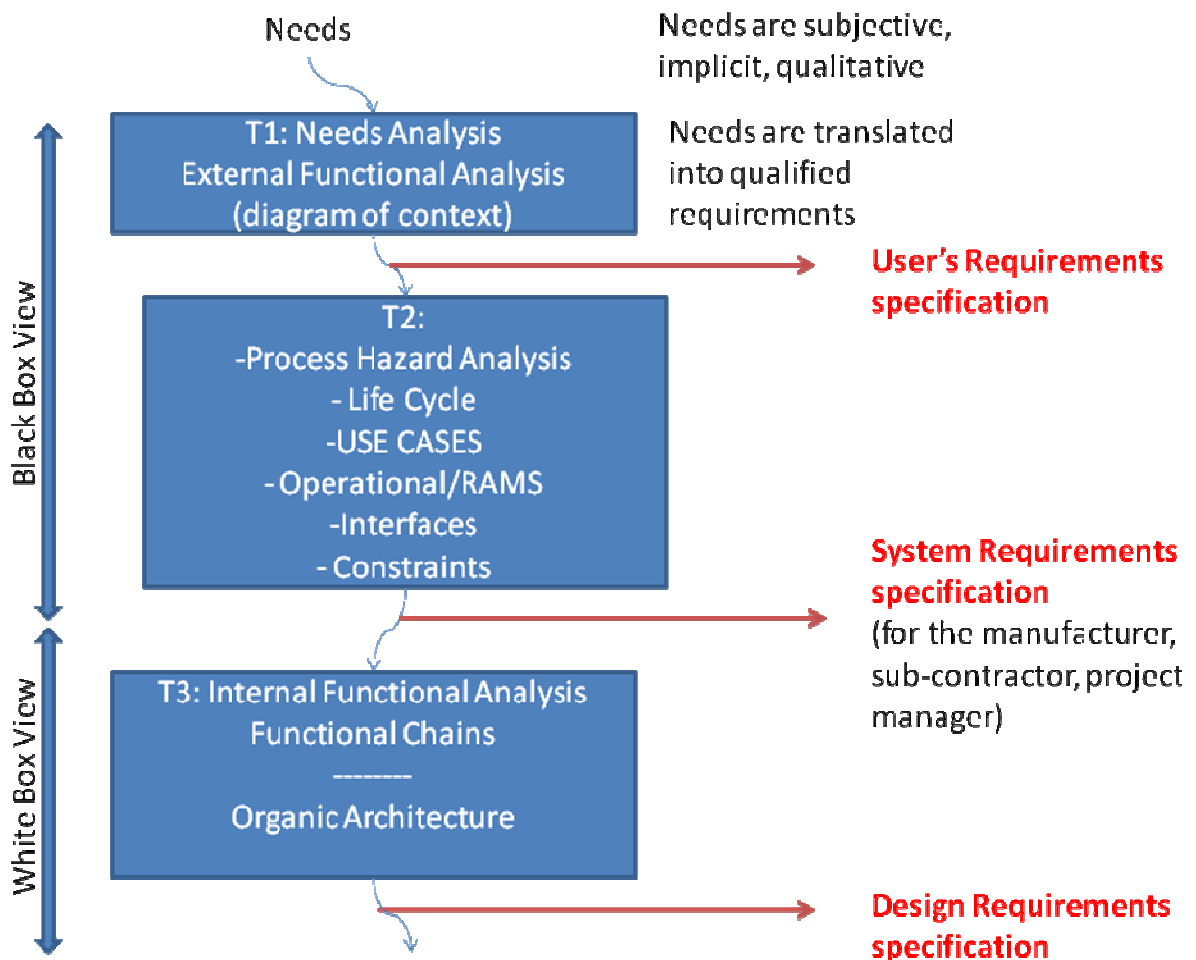
5.2. Upper Level

The upper level system of CIII is MELiSSA.
The upper system of MELiSSA is the ECLSS system.

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5.3. System of Interest Level

As explained in the AD2,
(--------------Methodology--)

Task1: Identification of the functions (external point of view, black box view)
Translation of the needs identified in chapter 4 into requirements through Needs
Analysis → **User's requirements specification**

Taks2: Includes life cycle phase, use cases, operational, rams, interfaces,
constraints

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➔ **System Requirements specification**

White Box view, identification of the chains of functions (internal functional analysis, organic architecture
  ➔ Design requirements **specification**
(---)

Express the requirements following the rules (see AD2) and MELiSSA DMS categories and sub-categories.

5.3.1.Functional Requirements

(and it sub-categories : Functional/Performance Control)

The requirement chapter has to be split into several sub-chapters for each sub-systems as identified in 2.4.

SYS-FUN-XXX-001   xxxx shall xxxx ….
Indicate for each requirement its properties :

Source	Indicates the need or requirement from which this requirement is allocated
Priority	{High; Medium; Low; Undefined}
Quality	{Complete; Incomplete; Vague; Un-checkable}
Flexibility	{Mandatory; Barely Negotiable; Negotiable; Negotiable if counterparts}. Indicate counterparts if any.
Critical for Safety	{Yes;No}
Maturity	{Analysis in progress; need review; accepted; rejected}
Validity	{Validated; Uncertain; Invalidated}
Validation Criteria	
Validation Value	
Max. Tol.	If any
Min. Tol.	If any
Validation Method	{Inspection; Review; Simulation; Testing; TBD}
Justification of the requirement	

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Requirement Template

Req. Identifier	Source	Text of the req.	Priority	Quality	Critical for Safety	Validity	Flexibility	Counterparts	Maturity	Val. Criteria	Val. Method	Val. Value	Tol+	Tol-	Justification

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5.3.2.Operational Requirements

(and it sub-categories: Modes & Scenarios, Operational Environment, RAMS, Human factors & ergonomics, Resources, Maintenance, Transportation & Storage, Documentation)

5.3.3.Interface Requirements

(and it sub-categories: Functional Interface, Physical Interface)

5.3.4.Constraint Requirements

(and it sub-categories: Physical, Design, Production, Maintenance, Logistics, Commissioning/Retirement, Cost & Delays, Quality, Regulation & Norms, IVVQ process)