Deliverable 1.4: Definition of Software-technical Interface

Dissemination Level: Confidential (CO)

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Context

Author(s): David Bruneel

Work Package: WP1

Task: 1.4

Document Status

Version: 0.1

Last modified: 31/01/2017

Status: Final

Approved by: Marwan Abdou-Ahmed

Date Approved: 06/02/2017

Declaration: Any work or result described therein is genuinely a result of the Hiperdias project. Any other source will be properly referenced where and when relevant

Table of Contents

1 Version History

Version	Summary of Change	Written By	Approver	Date
0.1	LASEA - First draft	David Bruneel		22/12/2017
0.2	C4L - Update	Noémie Dury		30/01/2017
0.3	LASEA - final update	David Bruneel		31/01/2017
1.0	First Issue		Marwan Abdou-Ahmed	06/02/2017

2 Scope

2.1 Description of the task

Definition of the requirements of the software-technical interfaces to be developed. These activities will focus on aspects of electrical, mechanical, optical and software interfaces between the different units (laser, scanner, axes, opto-mechanical elements). This communication will be ease of use, intuitive and flexible in the objective to answer the different industrial needs. The constant collection of the different partners' interface requirements will assure that their control and information can be optimally used. This information will be used in T6.1.

2.2 Introduction

The HIPERDIAS project consists in developing 3 applications. The fine cutting metal and diamond polishing applications are developed by C4L, and the 3D Silicon machining is developed by LASEA, so two different setups are developed in parallel:

- The demonstrator N°1 combines the development of a laser giving a power of several hundred watts and a laser system which will centralize all the control of the different elements: laser, booster, the movement of the beam, positioning of the sample, camera, beam auto-alignment, etc. The laser consists of a 50W laser Satsuma HP3 provided by Amplitude-Systèmes. This laser will be used as a seed. It will then be amplified by the thin-disk amplifier booster developed by the University of Stuttgart which will bring the power up to 500W. The booster will include a pulse compressor provided by AMO. This boosted laser will take on one optical table at the IFSW. Because of environment limitations (weight, space, etc.) the laser system will be on a different support than the boosted laser. This separation might introduce additional pointing stability, and be a source of beam shifting which will have to be managed. An auto-alignment system will be integrated in the laser system in order to manage such problem.

- The demonstrator N°2 is developed by C4L. It consists of a 200 W – ~500fs – 1MHz experimental laser provided by Amplitude-Systèmes. The laser consists in one single box of an approximate size of 475mm x 677mmx181mm as shown in Figure 1. This Laser will be integrated on a system including a galvo scanner with vision system including part recognition, close loop active topography measurement, quality control; a trepanation optic, a gas assisted cutting head and optics to manage the beam. Other laser sources (fiber, ns or fs laser) can be installed on the same system in order to make benchmark and comparisons when needed. The 200W laser and the associated system and optics are built to work in industrial-like conditions and environment.

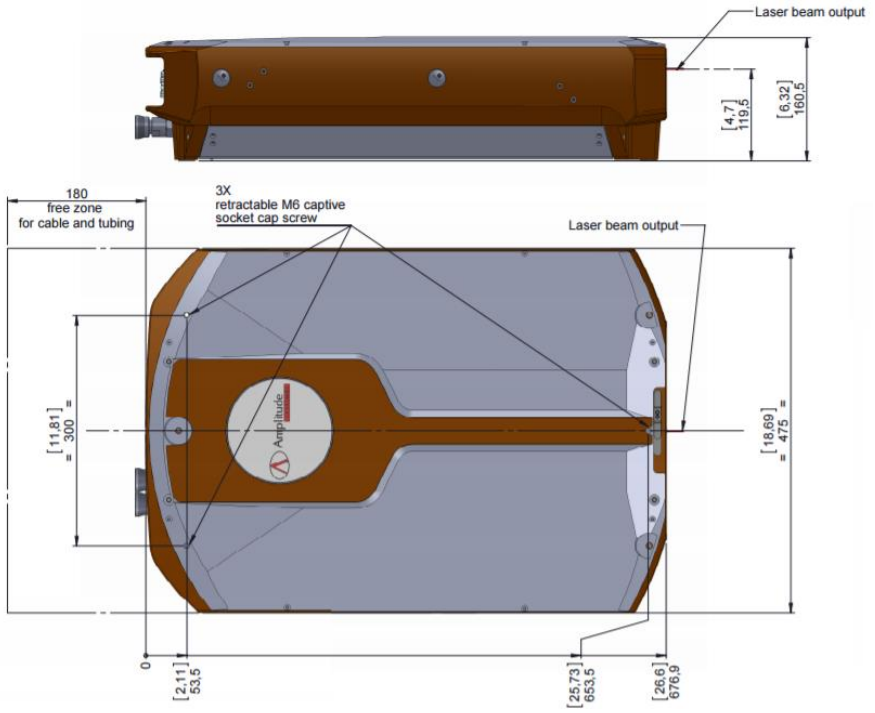

Figure 1 Approximation of the final 200W Laser

After the process development with the 200W laser, that shall happen by the second year of the project, the 200W laser will be put on the setup N°1 to replace the 50W seed laser. This is in order to upgrade the full system to reach an output power of 1kW.

2.3 Working method

In order to gather all the necessary information regarding interfaces, a spreadsheet has been proposed by LASEA to list and define the interfaces. This proposed document is to change; it is a living document to be completed during the definition task 1.4. Every partner has to fill its corresponding tab with the different interfaces details of the component(s) he is in charge. This document is made on the purpose to list all the interfaces of the demonstrator N°1, it is the same proposed to every partner, so only component-related cases have to be filled in. It consists of an excel spreadsheet with one tab per partner. Every tab intends to list all the different kinds of possible interfaces. It can be modified by every partner in order to fill the requirements.

This document gathers all the information from the different partners for the different interfaces. It is then possible to highlight the points to agree in case of technical mismatch. After every adding/modification/completion the partner has to fill the follow-up table. All partners involved technically are listed, but don't necessarily need to fill it. Extra documents can be provided as well (mechanical drawings, electrical drawings, etc.).

The first tab of this interfaces requirements document gives a short explanation, with a follow-up table supposed to be modified by every partner. The second tab presents a sketch of the demonstrator including all the components that will be part of the demonstrator, so every interface can easily be highlighted as illustrated in figure 1. Every interface has been given a number and the kind of interface is also associated to each of them as shown in the table 1.

2.4 Demonstrator N°1 – 500W Laser – Lasea

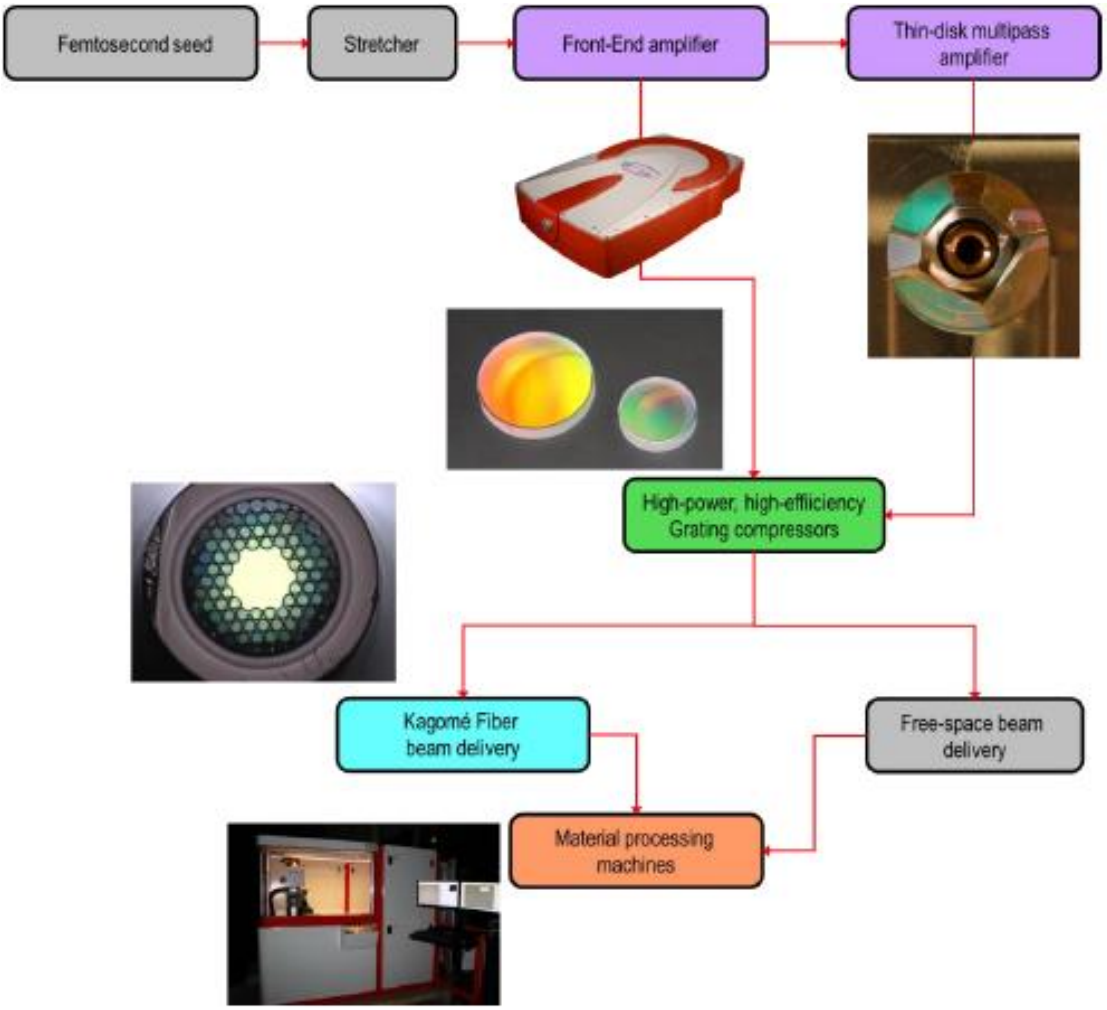

Figure 2: Sketch of the demonstrator N°1 illustrating the different components assembly

Interface number	Partners involved	Type of interface
1	USTUTT <-> AMP	MECHANICAL/ELECTRICAL/WATER
2	USTUTT <-> AMP	MECHANICAL/OPTICAL
3	USTUTT <-> USTUTT	MECHANICAL/ELECTRICAL/WATER
4	USTUTT <-> LASEA	SOFTWARE/ELECTRICAL
5	AMP <-> LASEA	SOFTWARE/ELECTRICAL
6	AMP <-> [AMO-USTUTT]	OPTICAL
7	USTUTT <-> [AMO-USTUTT]	MECHANICAL/OPTICAL
8	USTUTT <-> [AMO-USTUTT]	MECHANICAL/ELECTRICAL
9	[AMO-USTUTT] <-> [GLO-XLIM]	MECHANICAL/OPTICAL
10	LASEA <-> USTUTT	MECHANICAL/ELECTRICAL/WATER
11	[AMO-USTUTT] <-> LASEA	MECHANICAL/OPTICAL
12	[GLO-XLIM] <-> LASEA	MECHANICAL/OPTICAL
13	LASEA (Software) <-> LASEA (Auto-alignment)	MECHANICAL/OPTICAL/ELECTRICAL/SOFTWARE
14	LASEA (Software) <-> LASEA (Scanner)	MECHANICAL/OPTICAL/ELECTRICAL/SOFTWARE

Table 1: List of identified interface associated with the involved partners and the kind of interface.

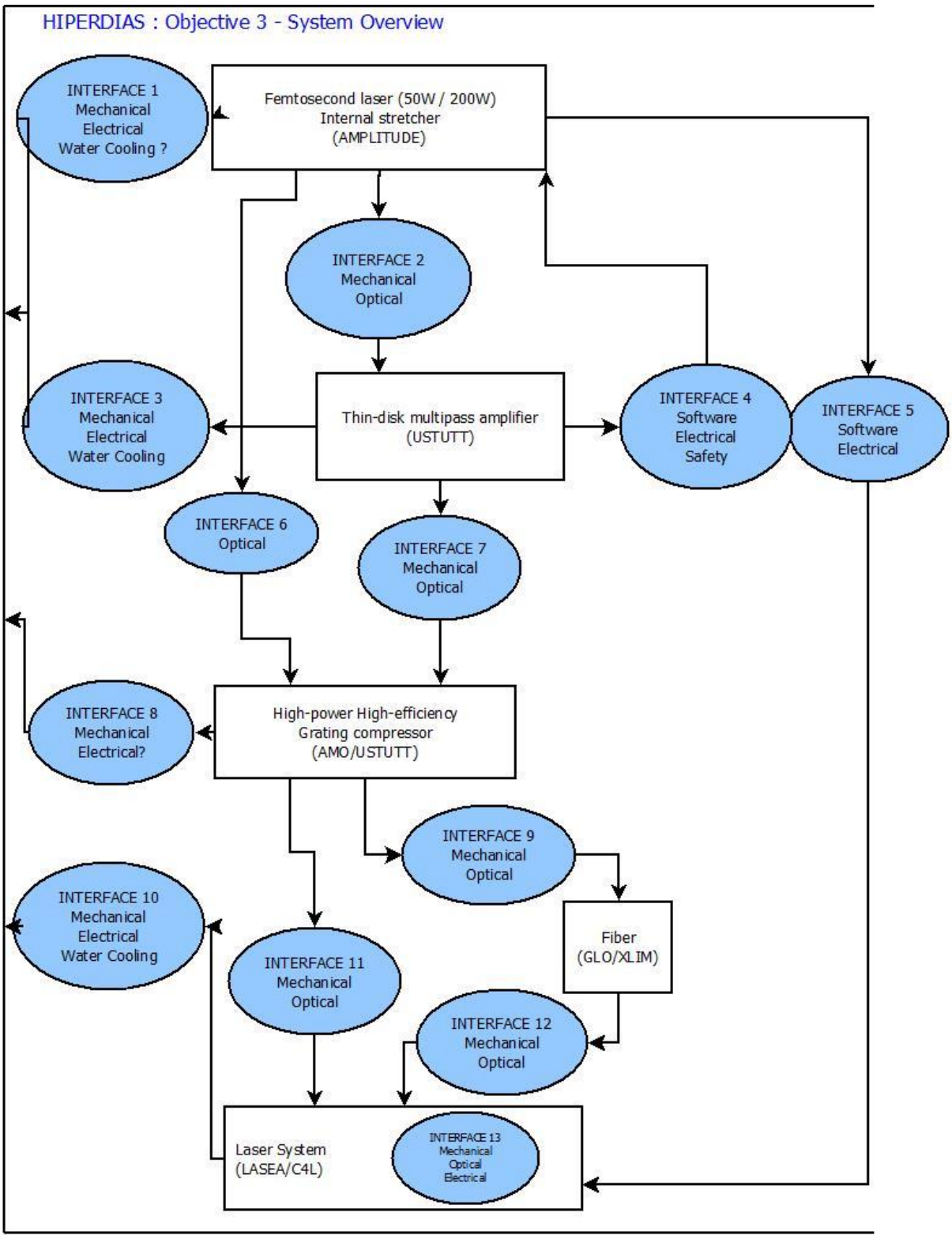

Figure 3: sketch of the demonstrator N°1 composed of the different components. It highlights all the interfaces between every component.

2.5 Demonstrator N°2 - 200W laser - C4L

Interface number	Partners involved	Type of interface
1	AMP ◀◀ ▶▶C4L (Motion)	SOFTWARE/ ELECTRICAL/ WATER?
2	AMP ◀◀ ▶▶C4L (Vision)	MECHANICAL/ OPTICAL
3	AMP ◀◀ ▶▶ GLO-XLIM (Fiber)	MECHANICAL/ OPTICAL/ WATER?
4	GLO-XLIM (Fiber) ◀◀ ▶▶ C4L (Vision/Scanner)	MECHANICAL/ OPTICAL/ WATER?
5	(Software) C4L ◀◀ ▶▶C4L (Scanner/Motion/Vision)	SOFTWARE/OPTICAL
6	(Scanner/ Vision) C4L ◀◀ ▶▶C4L (Motion)	MECHANICAL/ ELECTRICAL/ OPTICAL/ SOFTWARE
7	(Machine) C4L ◀◀ ▶▶C4L (Part to Proceed)	MECANICAL / OPTICAL (Vision) / ATMOSPHERE (Exhaust)
8	(Machine) C4L ◀◀ ▶▶E6 (Part to Proceed)	MECANICAL / OPTICAL (Vision) / ATMOSPHERE (Exhaust)

Table 2: List of identified interface associated with the involved partners and the kind of interface.

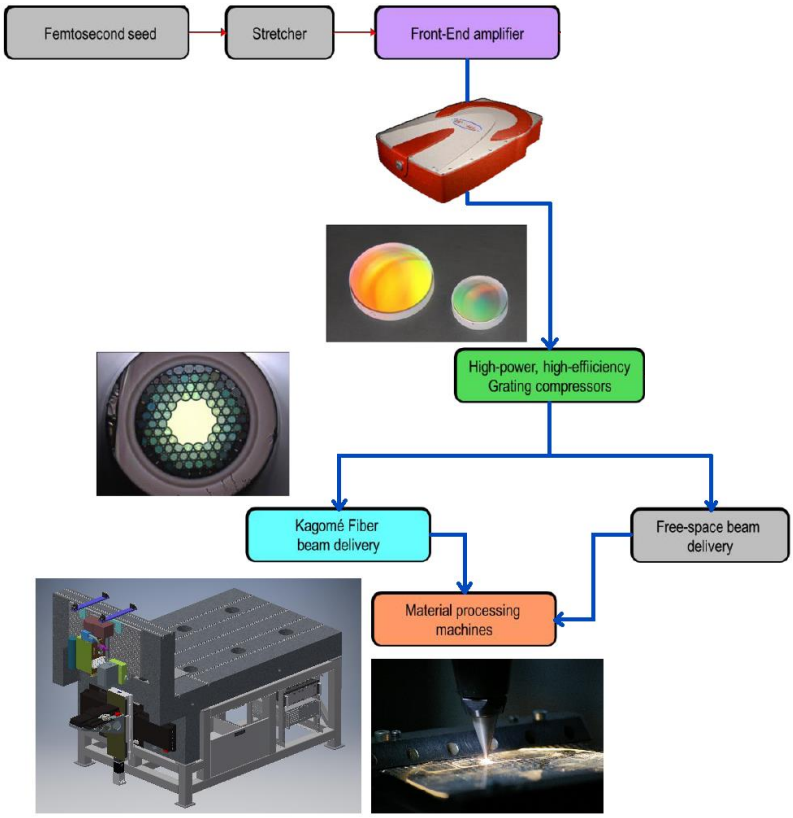

Figure 4: sketch of the demonstrator N°2 composed of the different components and steps

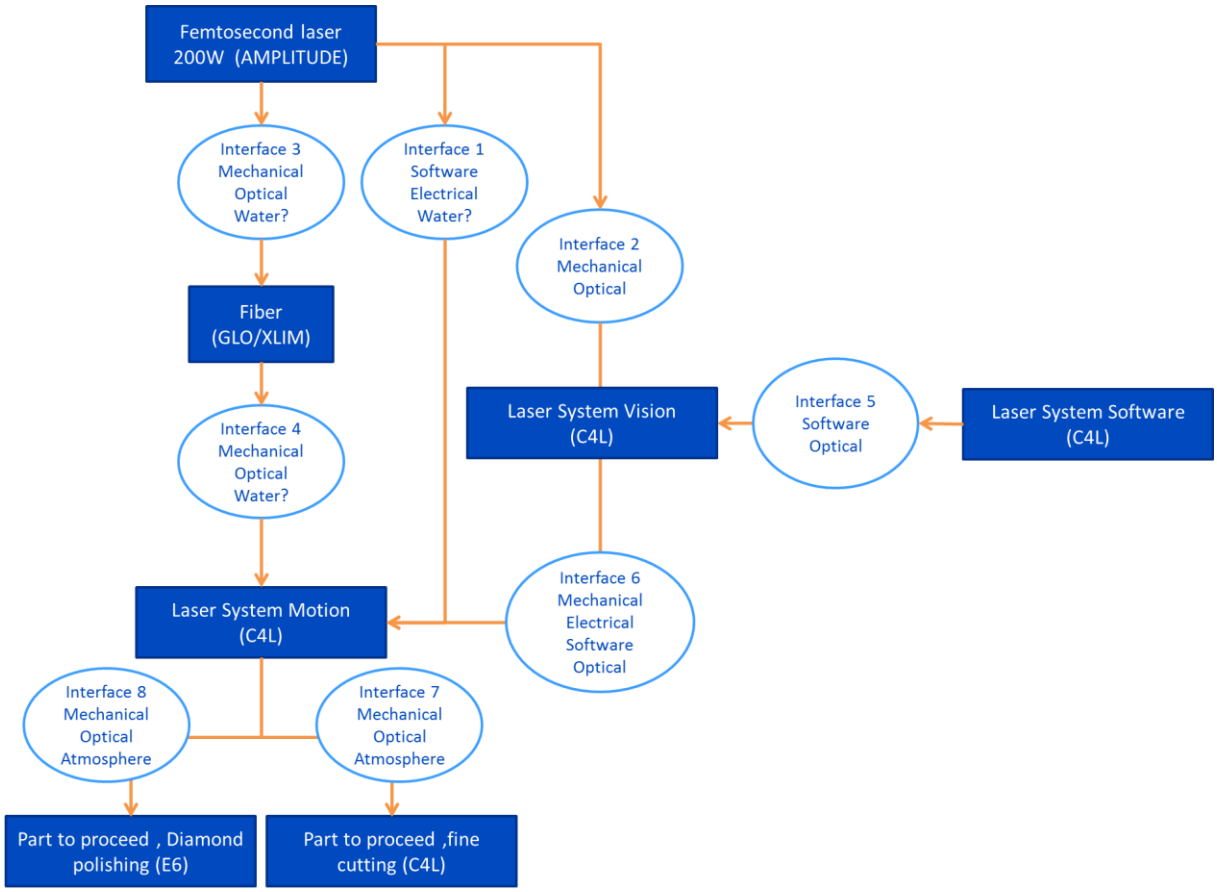

Figure 5: Sketch of the demonstrator N°2 composed of the different component; It highlights all the interfaces between every component.

2.6 Conclusion:

The different elements of the two different setups have been studied and every partner has given the information necessary that defines the different technical aspects of the interfaces between every component. At the end, 14 interfaces have been identified for the demonstrator N°1, and 8 interfaces for the demonstrator N°2, describing different technical aspects to take into account. The different aspects of every interface is described in details in the deliverable D6.1.

This report should be considered a 'living document', as such it will be adapted, as required, during the course of the project. The content should not be seen as fixed and final but may be subject to change, depending on the progress of the project.