SAFE STRIP

SAFE and green Sensor Technologies for self-explaining and forgiving Road Interactive aPplications

Grant Agreement Number: 723211

D1.1: Benchmarking Database

Work package	WP1: Benchmarking and Use Cases
Activity	A1.2: Benchmarking of relevant technologies
Deliverable	D1.1: Benchmarking Database
Authors	N. Bakalos (ICCS)
Status	Final (F)
Version	2.0
Dissemination Level	Public (PU)
Document date	19/09/2017
Delivery due date	19/09/2017
Actual delivery date	19/09/2017
Internal Reviewers	Dionysis Kehagias, CERTH/ITI Thanasis Kotzakoloios, UPAT
External Reviewers	Prof. George Dimitrakopoulos
	This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement no 723211.

Document Control Sheet

Version history table			
Version	**Date**	**Modification reason**	**Modifier**
0.1	14.07.17	First complete version of Deliverable	N. Bakalos, ICCS
0.2	19.07.17	Version for peer review (amendments included)	N. Bakalos, ICCS
1.0	31.07.17	Final release for submission, addressing peer review comments	N. Bakalos, ICCS
1.1	18.09.17	Revised submitted version, addressing comments from PO	N. Bakalos, ICCS
2.0	19.09.17	Final edits on revised submitted version	N. Bakalos, ICCS M. Gkemou, CERTH/HIT

Legal Disclaimer

This document reflects only the views of the author(s). Neither the Innovation and Networks Executive Agency (INEA) nor the European Commission is in any way responsible for any use that may be made of the information it contains. The information in this document is provided "as is", and no guarantee or warranty is given that the information is fit for any particular purpose. The above referenced consortium members shall have no liability for damages of any kind including without limitation direct, special, indirect, or consequential damages that may result from the use of these materials subject to any liability which is mandatory due to applicable law. © 2017 by SAFE STRIP Consortium.

Table of Contents

List of Figures

Abbreviation List

Abbreviation	Definition
CMS	Content Management System
DBMS	DataBase Management System

Executive Summary

This Deliverable, entitled "Benchmarking Database", delivers a database with all the information of technologies relevant to SAFE STRIP objectives.

This report is an accompanying report to the Database itself, presenting the database structure, all the interfaces relevant to entering, editing and presenting the data stored in the database, as well as the procedures that the consortium will follow to keep the database up to date.

Finally, templates, which correspond to each type of item that is foreseen to be entered in the database and have served (and will continue to serve for content collection), are presented. These templates are attached as annexes to this Deliverable.

Currently the database has **14 different tables** with **147 different fields** and **32 distinct entries**. The goal of this database is to support all benchmarking and system specification activities of the project, across the various fields in WP2 and WP3, but also the market analysis of A7.3 and to be constantly updated to track State of the Art and latest trends in all SAFE STRIP fields of activity. The critical discussion on the contents of the database will be held in D1.2: "SAFE STRIP Use Cases and application scenarios" resulting in the identification of the most valuable to SAFE STRIP findings as well as the existing technological gaps, if any, that, in combination with A1.1: "Stakeholders needs" outcomes and the project Use Cases will feed the development path of the project. Any updates that will occur in the database (content and/or structure itself) until M6 will be also reported in summary in D1.2.

Chapter 1 introduces the purpose, intended audience and interrelations of the current document and the database itself, as well as the interrelation of this with other work items of the project. **Chapter 2** summarises the technologies used for the development of the database, **Chapter 3** presents the database structure and **Chapter 4** the database interfaces and the update mechanisms that have been/will be followed. **Chapter 5** summarises the resources that have been used for the content of the database and **Chapter 6** concludes the report. **Annex 1** provides the data collection templates being used.

1   Introduction

1.1   Purpose of the document
This report serves the purpose of presenting the efforts of the SAFE STRIP consortium towards the development of a database for the benchmarking of technologies, engineering breakthroughs and scientific innovations relevant to the endeavors of SAFE STRIP.

The benchmarking database encompasses all the science, technological and engineering breakthroughs relevant to the SAFE STRIP objectives in the fields of micro/nano sensors, energy management, ITS interfaces and services, encapsulation mechanisms, infrastructure materials and communication techniques. The findings of the benchmarking are structured in a database hosted in ICCS servers. The dissemination of this knowledge happens through a dedicated web interface that is accessible to public and can be also accessed through the project web site (www.safestrip.eu).

The interface is deployed in the domain
http://optical01.telecom.ece.ntua.gr/safestrip-benchmarking

The updates that will occur until M6 as well as a critical synopsis of the benchmarking database content will be included in upcoming D1.2 "SAFE STRIP Use Cases and application scenarios" due for M6 (November 2017).

The consortium will keep this database up to date during the project lifespan, monitoring all relevant findings and thus establishing the soundness and innovation of the project's developments.

1.2   Intended audience
The intended audience of the database are relevant stakeholders of the SAFE STRIP innovations such as road owners, private and public infrastructure and TMC operators, road users federations/clubs (including car drivers and motorcyclists), construction companies and contractors, ITS and service providers, automotive (and PTW) industry, Tier 1/2 suppliers, policy makers and, of course, traffic safety experts and researchers.

1.3   Interrelations:
The efforts towards the realisation of this database are related with the project activities relevant to the system specifications and the technical endeavours of WP2 and WP3 as well as the market analysis that is a part of WP7 (A7.3).

2   Selected technologies
To develop the database and all the relevant interfaces for inputting, editing, deleting and presenting the gathered benchmarking data a number of different technologies were used.

The selected database management system (DBMS) for the benchmarking database is MySQL[1]. MySQL is the most popular DBMS for relational databases used by many applications such as phpBB, WordPress and Joomla as well as a large number of web sites. MySQL was selected among other DBMS technologies due to the large community supporting the framework, the extended functionality that the framework offers as well as its ability to be easily integrated to front-end technologies, thus facilitating the presentation of the store data to interested stakeholders.

To manage the data in the database, including input, update, and delete procedures, phpMyAdmin[2] was used. PhpMyAdmin is an open source administration tool for MySQL that provides web interfaces, database management importing and exporting of data.

Both the database and the phpMyAdmin interface are hosted in ICCS servers. For presenting the data a Wordpress[3] interface was developed. Wordpress is an open source Content Management System (CMS). As of January 2015 more the 23.3% of the top 10 million websites were using Wordpress[4].

3   Database structure
The developed database structure is presented in the figure below. The database tables include:
- Sensors
- Microcontrollers
- Energy Harvesting & Management Modules
- Batteries
- Infrastructure materials/solutions
- C-ITS applications and technologies (of relevance to SAFE STRIP)
- Algorithms
- Encapsulation techniques
- Communication Mechanisms

as well as a number of additional tables for the better representation of data.

The database structure is presented in Figure 1.

The structure of the database was finalised in three steps. Initially, ICCS distributed an initial proposal for the structure to all project partners, requesting feedback both in a holistic and a targeted way, taking into account the varying expertise of project partners. From this feedback we derived the second version of the structure, which was in turn updated/adjusted during the data input, to better demonstrate the information provided by the technology providers.

The selected structure of the database is able to address components of varying readiness levels, from commercial products to research prototypes that are the result of research projects with similar objectives and intended outcomes to SAFE STRIP. The source of the information is included in every info cluster/component of the

---

[1] https://www.mysql.com/
[2] https://www.phpmyadmin.net/
[3] https://wordpress.com/
[4] *"Beginner's Guide to Starting a WordPress Blog"*. *Retrieved November 15, 2015.*

database. This is essentially a URL that redirects the user to the complete component's specifications (i.e. either to the market product or the research project where this was developed).

Finally, SAFE STRIP is expected on one hand to progress the state of the art in specific areas (i.e. intelligent algorithms) and, on the other hand, to integrate various software and hardware components (e.g. sensors, encapsulation materials, microcontrollers) in order to achieve its envisaged implementations. To this end, only when it is applicable, meaning when SAFE STRIP is expected to have significant novel developments in the respective field, the corresponding tables of the database include fields with the analysis of benefits and innovation of SAFE STRIP in comparison to the identified items in each case. Still, the applicability level will be examined in almost all cases (as an on-going parallel exercise to *WP2: System Architecture and specifications* and *WP3: SAFE STRIP sensorial and communication system development* stabilised architectures and specifications).

Currently, the database includes **147 individual fields**, spread among **14 different table**s and has **32 distinct entries** and is continuing to grow.
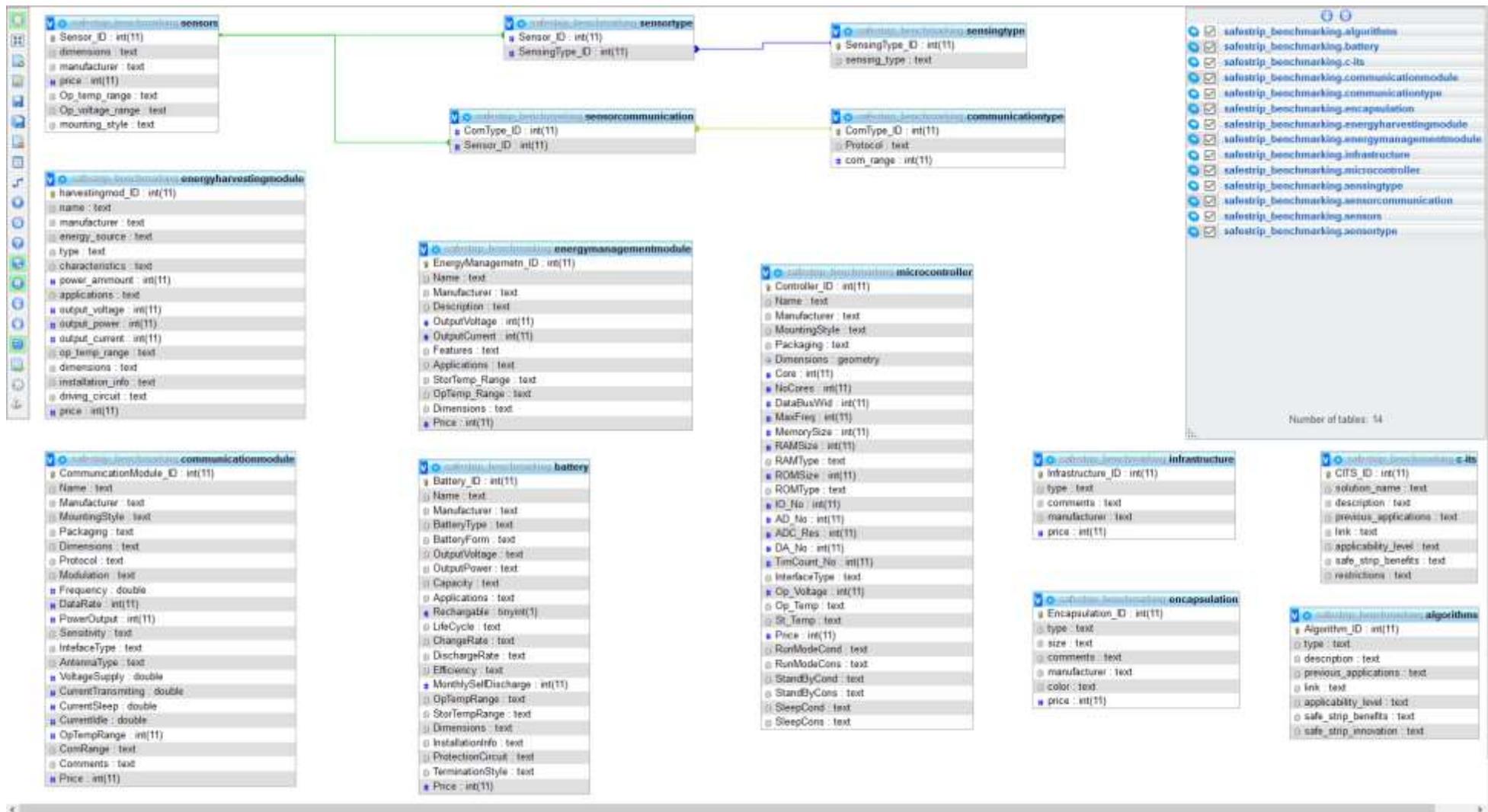
Figure 1: Benchmarking Database Schema.

4 Database Interfaces

As mentioned above, the interface for inputting and updating the database data is based on the phpMyAdmin framework. A screenshot of the framework is presented in Figure 2.
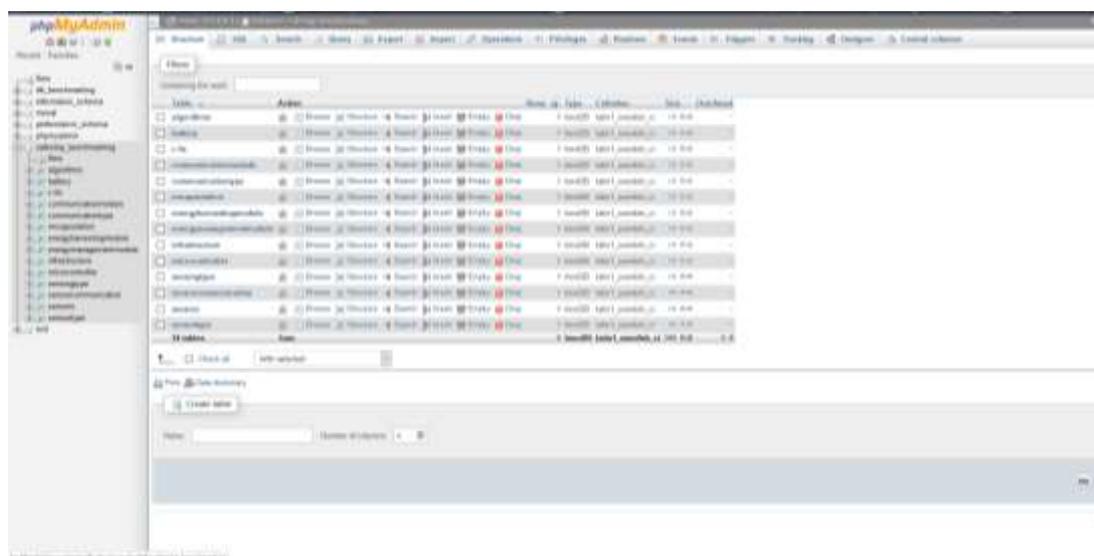

Figure 2: phpMyAdmin interface for managing the benchmarking database data.

For entering new data on the database, specific report templates were created and provided in Annex 1. As mentioned before, the database will be continuously updated throughout the lifespan of SAFE STRIP. ICCS is the sole administrator of the database. Insertion and updating of data will be executed from ICCS as a result of consultation with SAFE STRIP partners, who will provide the data following the format of the tables presented in Annex 1 of this document. All consortium partners are able to initiate a request to edit the data from ICCS. ICCS will also request updates from all partners on a bi-monthly basis as well as during the finalisation of project critical milestones in M18 (October 2018), M24 (April 2019), and M36 (April 2020).

The presentation/exploration of the data of the database to the general public will take place through a dedicated web interface. The interface is depicted in Figure 3 and is made accessible through the project web site (www.safestrip.eu).

The web interface acts essentially as a search engine for the database, where the user can enter keywords and see all the relevant information stored in the database. The interface supports fuzzy (partial) matching, searching with entire phrases, and query logging. The returned results are sorted by relevance. **A blank search will return the entire contents of the database.**

Figure 3: SAFE STRIP Web Interface.

5 Resources

The data from the database includes outcomes of relevant to SAFE STRIP projects, products of the SAFE STRIP consortium partners, products of solution providers external to the Consortium as well as solutions described in scientific publications (journal papers, conference proceedings, white papers). ICCS will continuously monitor the each product and technology and adjust/update the contents of the database following the procedures described in section 4 of this report.

6 Conclusions

The SAFE STRIP benchmarking database is the tool that keeps track of each product and technology relevant to the project's objectives, indexing their corresponding developer/supplier/provider, indicative cost, technical scope and features, evaluation reports and recent developments as well as their pros and cons and applicability to SAFE STRIP (when applicable). After the technology selection, data acquisition and consultation within the consortium, a database with 14 tables and 147 fields has been created that hosts currently 32 different solutions (current status; July 2017). The contents of this database will be updated bi-monthly. For facilitating the editing of the data and for the data presentation two different interfaces were created. The first updates and a critical summary of the benchmarking database content will be included in D1.2 "SAFE STRIP Use Cases and application scenarios" due for M6 (November 2017).

Still, and beyond that, the benchmarking database of SAFE STRIP will be a living tool through the project lifespan to support all technical and market activities of the project.

Annex 1: Templates for data input

The tables provided below have been used for data collection and entry to the Database by the Consortium and ICCS respectively (who acts as the administrator). Each row of the table corresponds to one field of the database (with the exception of IDs and other unique identifiers of the products that are generated automatically by the DBMS framework).

Algorithm	
Type	
Description	
Previous Applications	
Link (for more information)	
Applicability Level	
SAFE STRIP Benefits	
SAFE STRIP Innovations	
Applicability/usage level for SAFE STRIP	
Link (for more information)	

Battery	
Name	
Manufacturer	
Battery Type	
Battery Form	
Output Voltage	
Output Power	
Capacity	
Applications	
Rechargeable	Yes/No
Cycle Life	
Charge Rate	
Discharge Rate	
Efficiency	
Monthly Self Discharge	
Operating Temperature Range (Charge/Discharge)	
Storage Temperature Range	
Dimensions (L/W/H) (mm)	
Installation Info	
Protection Circuit	
Termination Style	
Price	
Applicability level for SAFE STRIP	
Link (for more information)	

C-ITS applications/ technologies	
Solution Name	
Description	
Previous Applications	
Link (for more information)	
Applicability Level	
Restrictions	
SAFE STRIP Benefits	
SAFE STRIP Innovations	
Link (for more information)	

Communication Module	
Name	
Manufacturer	
Mounting Style	
Packaging	
Dimensions	
Protocol	
Modulation	
Frequency	
Data Rate	
Output Power	
Sensitivity	
Interface Type	
Antenna Type	
Voltage Supply	
Current (Transmitting)	
Current (Sleep)	
Current (Idle)	
Temperature Range (Operation)	
Communication Range	
Comments	
Price	
Applicability level for SAFE STRIP	
Link (for more information)	

Encapsulation	
Type	
Size	
Comments	
Manufacturer	
Color	
Price	
Applicability level for SAFE STRIP	
Link (for more	

information)	

Energy Harvesting Module	
Name	
Manufacturer	
Energy Source	
Type	
Characteristics	
Amount of Power	
Applications	
Output Voltage	
Output Power	
Output Current	
Temperature Range (Operation)	
Dimensions	
Installation Info	
Driving Circuit	
Price	
Applicability level for SAFE STRIP	
Link (for more information)	

Energy Management Module	
Name	
Manufacturer	
Description	
Output Voltage	
Output Current	
Features	
Applications	
Temperature Range (Operation)	
Temperature Range (Storage)	
Dimensions	
Price	
Applicability level for SAFE STRIP	
Link (for more information)	

Infrastructure material/solution	
Type	
Comments	
Manufacturer	
Price	
Applicability level for SAFE STRIP	

Link (for more information)	

Micro Controller	
Name	
Manufacturer	
Mounting Style	
Packaging	
Dimensions	
Core	
Number of Cores	
Data Bus Width	
Max Clock Frequency	
Memory Size	
Data RAM Size	
Data RAM Type	
Data ROM Size	
Data ROM Type	
Number of I/Os	
Number of A/D Channels	
ADC Resolution	
Number of D/A Channels	
Number of Timers/Counters	
Interface Type	
Operating Supply Voltage	
Temperature Range (Operation)	
Temperature Range (Storage)	
Price	
Run Mode Conditions (Clock Fr./ Voltage)	
Run Mode Consumption(Min/Typ/Max)	
Stand by Mode Conditions (Clock Fr./ Voltage)	
Stand by Mode Consumption(Min/Typ/Max)	
Sleep Mode Conditions (Clock Fr./ Voltage)	
Sleep Mode Consumption(Min/Typ/Max)	
Applicability level for SAFE STRIP	
Link (for more information)	

Sensor	
Type	
Communication Interfaces	
Dimensions	
Manufacturer	
Price	

Sensor	
Temperature Range (Operation)	
Voltage Range (Operation)	
Mounting Style	
Applicability level for SAFE STRIP	
Link (for more information)	