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D4.3a – PRIMARY SYSTEM DESIGN

Project Acronym:	**Smart RRS**
Project Full Title:	**Innovative Concepts for smart road restraint systems to provide greater safety for vulnerable road users.**
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SUMMARY:

This document provides a summary of the current design options and decisions for a Primary safety system for the Smart Road Restraint Systems project.

Note this document is highly incomplete and reflects the fact that this work-package is still in the requirements phase.

Contents

References

No.	Reference, description
[1]	**D4.1 Concept requirements for Smart RRS Primary Safety System**; *57536-16bDraft12Nov09 - D4-1 Requirements.doc*. The document in which the top level requirements are identified for the Primary System.
[2]	**D4.2 – Primary System Architecture**; *57536-16e Provisional 01Jun10 - D4-2 Primary System Architecture.doc*. The document which proposes a system architecture and expands the requirements for the different modules within the Primary System.
[3]	**D5.3 – Tertiary system design**; *57536-17d Provisional 04Jun10 - D5-3 Tertiary System Design.doc*. The equivalent document to this one for the Tertiary Safety System. Note that elements of the Primary Safety System overlap with the Tertiary Safety System (e.g. the Gateway Module) so these are only covered within the Primary system design document where there are differences.

1. INTRODUCTION

This document is intended to capture current design options and key design decisions for the Primary Safety System based on the Primary System Requirements [1] and Architecture [2] documents.

Because of the overlap between the Primary and Tertiary systems, some aspects of this document are covered in the Tertiary System design document [3].

The figure below gives an overview of the system and is intended as a reminder of the top-level components of the system.

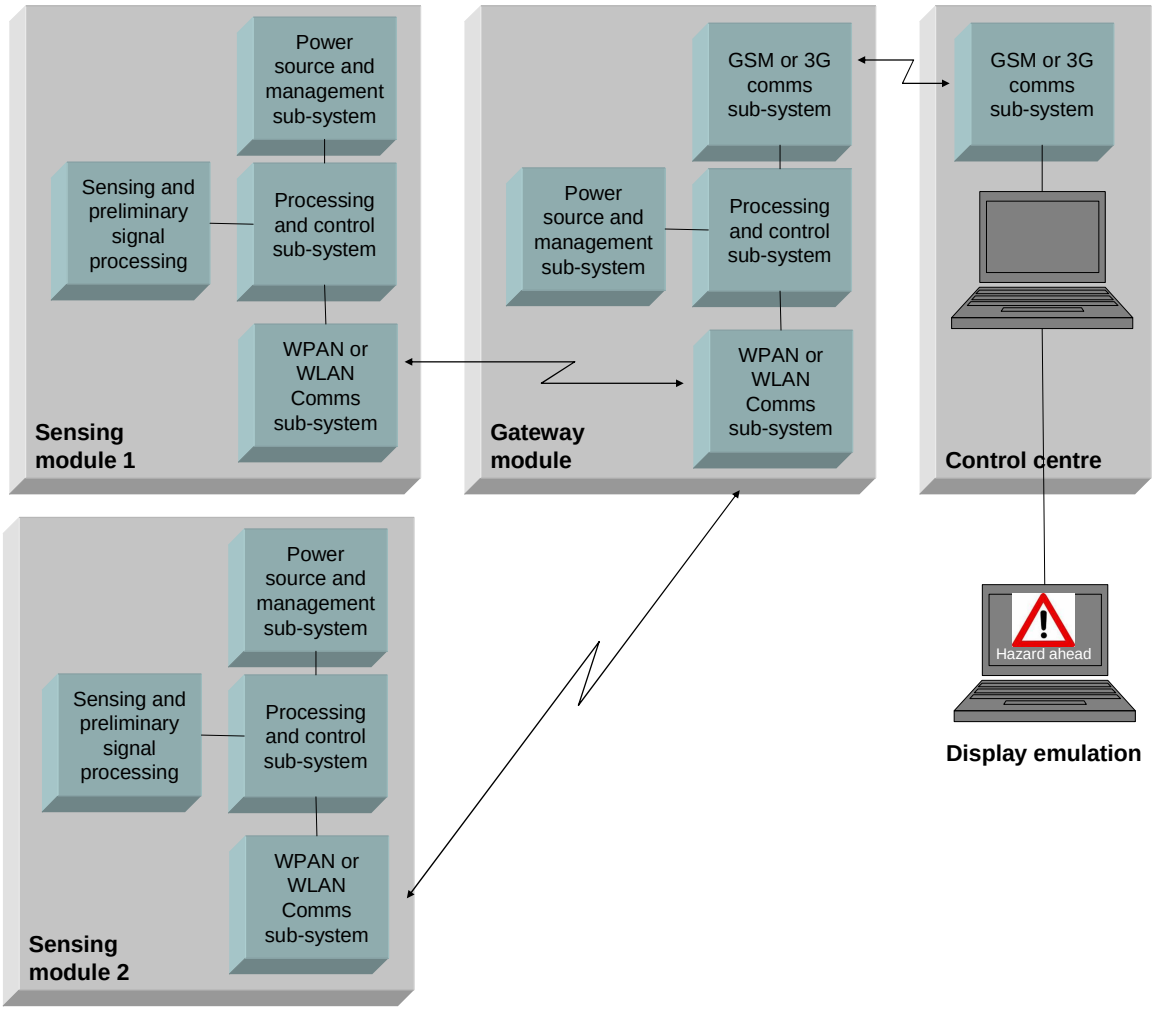

Figure 1: Primary System Overview

This document is live and at an early stage of writing.

At this stage of development, an environmental sensing module and an obstacle sensing module are being considered.

2. ENVIRONMENTAL SENSING MODULE

2.1 SENSING SUB-SYSTEM

Design options have not yet been considered apart from stating that rather than developing or buying specialist off the shelf sensing systems, it is planned to use low cost environmental sensors such as pressure, temperature and %RH and to use these to infer the potential hazard conditions.

A low cost off-the-shelf sensing sub-system such as Cypress' CY3271-EXP1 environmental sensing module has been considered.

2.2 PROCESSING SUB-SYSTEM – HARDWARE

2.2.1 OVERVIEW

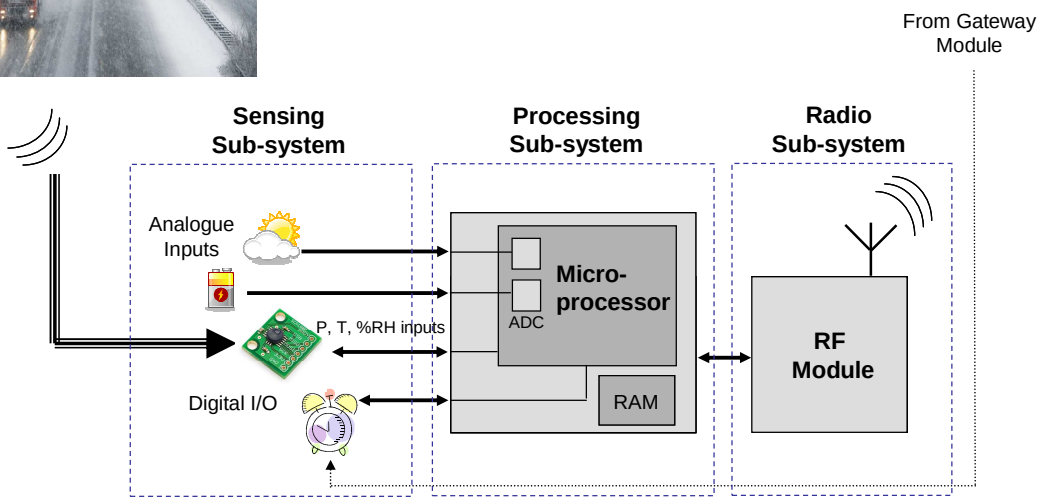

Figure 2: Environmental sensing module overview

2.2.2 HARDWARE PLATFORM OPTIONS

It is to be hoped that this module would be able to share much of the same hardware as the Tertiary Sensing Module. Again, one of the low power MSP430 microprocessor hardware platforms available to Conekt would seem the best solution. For further discussion of the options see reference [3], section 2.2.2.

2.2.3 INTERFACES

Likely sensor inputs have not yet been considered in any detail.

Analogue

- Environmental sensor inputs
- System voltages (particularly battery)
- Sunlight sensor?

Digital bus

- Interface to RF module.
- Potentially a commercial-off-the-shelf sensing module might interface to the processor via a bus such as SPI or I^2C.

2.3 PROCESSING SUBSYSTEM – FUNCTIONAL

At a top level these are the tasks that need to be performed by the processing sub-system of the Primary sensing module.

- Periodically measure the environmental sensors.
- Analyse the data to determine:
  - Likely visibility (fog or rain likelihood)
  - Road surface state (likelihood of rain or ice).

    Note that the algorithms for doing this are yet to be determined.
- Report the data via the module's radio sub-system communicating:
  - Location identifier
  - Timestamp
  - Event category.
- Periodically synchronize the module's clock with the gateway module (this function may possibly be performed by the radio sub-system).
- Periodically measure diagnostic information and report back to the gateway module via the radio sub-system.

Note that the periodicity of both the sensor measurement and the diagnostics / clock synchronization is yet to be determined.

Discussion of the periodicity of the clock synchronization can be found in the reference [3], section 2.3.

2.4 RADIO SUB-SYSTEM

The radio sub-system of the environmental sensing module is likely to be identical to that discussed in reference [3], section 2.4.

2.5 POWER SUBSYSTEM

The key decision here for the Environmental Sensing Module is: can we get a significant number of years (10+) using a battery?

This calculation is yet to be carried out. Discussion of the power sub-system design options are covered in reference [3], section 2.5.

3. OBSTACLE SENSING MODULE

There remain many options for this module and since the requirements have not been properly defined, no detail is available at time of writing.

4. GATEWAY MODULE

The Gateway Module is shared by both the Primary and Tertiary Systems. Details are covered in reference [3], section 3.

5. CONTROL CENTRE SUB-SYSTEM

The requirements are yet to be reviewed and completed hence this level of detail is not available.