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INTEGREEN

Action 4: Implementation & Integration

P.4.2.2

On-board environmental monitoring unit prototype

Project Coordinating Beneficiary	Municipality of Bolzano
Project Associated Beneficiary n.2	TIS innovation park (TIS)
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[1] **PU** = Public; **CO** = Confidential (for members of the consortium only, including the European Commission); **RE** = Restricted, i.e. only a selected target of stakeholders defined by project consortium and validated by European Commission can access to the document. The final dissemination level will be defined in cooperation between the INTEGREEN consortium and the European Commission.

Table of Contents

Table of Figures

1 Introduction

The Implementation phase follows directly the design specification phase and it relies on the V-model approach as show here below in Figure 1.

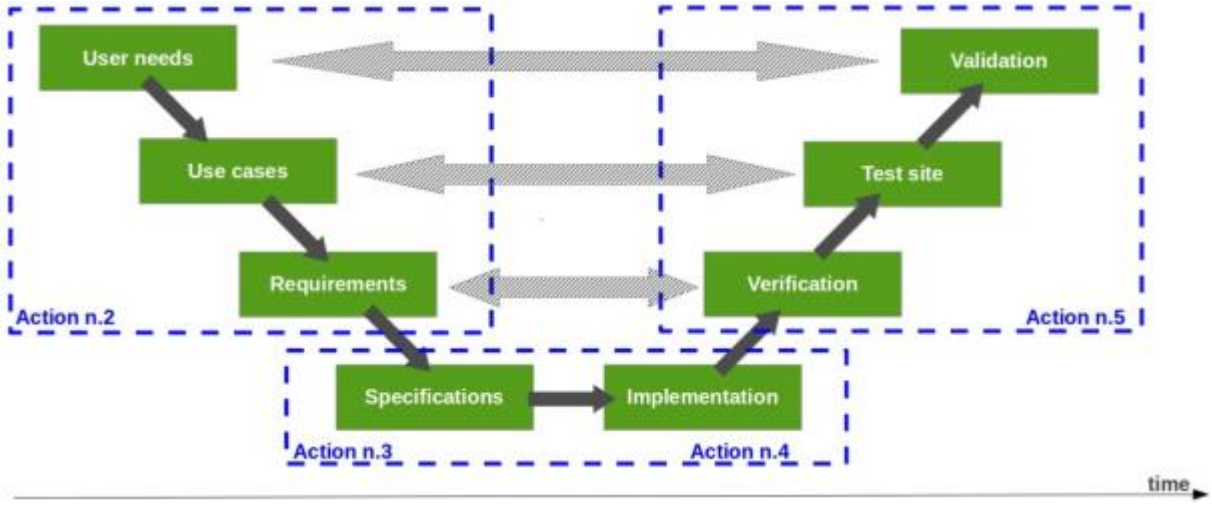

Figure 1: The V-model approach applied in the INTEGREEN project

The Implementation and Integration action aims primarily at producing the physical prototypes for the INTEGREEN Systems. It is executed after the Design phase which is the main input to this Action as it can be seen in Figure 1.

1.1 Purpose of the document

This document deliverable P.4.2.2 is one of the deliverables of Action 4: Implementation and Integration under the responsibility of AIT. AIT is the responsible beneficiary for the activities in Action 4 and directly responsible for the execution of Task 4.2 Mobile systems implementation as well as for the execution of Task 4.3 System integration. The execution of Task 4.1 Supervisory Centre component implementation is under the responsibility of TIS.

Task 4.2 is divided into four activities as follows:

- On-board traffic monitoring unit
- Environmental sensors
- On-board environmental monitoring unit
- On-board telematic unit

All the Mobile subsystems to be implemented and produced in Task 4.2 are clearly visible in Figure 2 below.

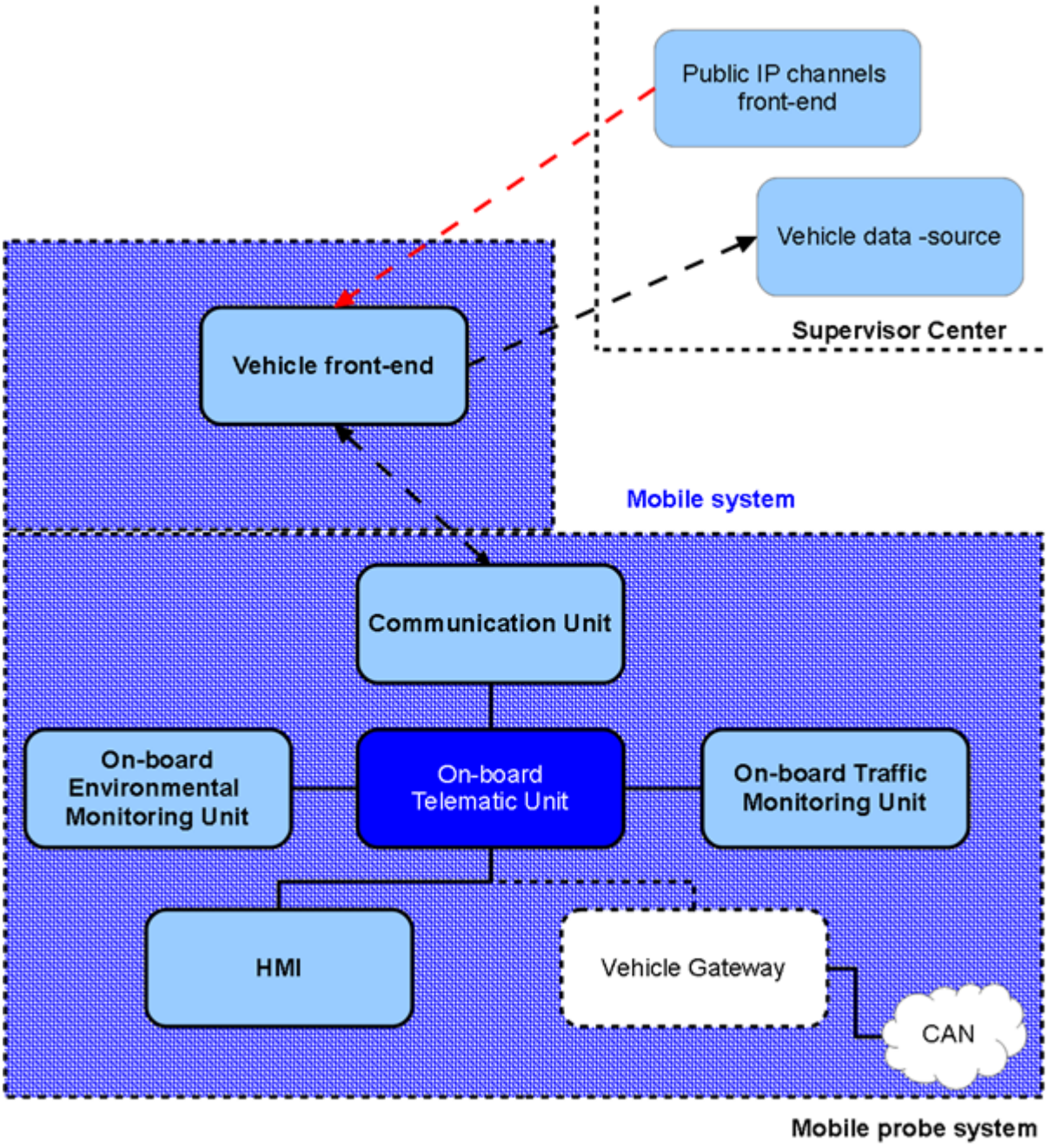

Figure 2: The reference architecture of the INTEGREEN mobile system

1.2 Mobile system implementation

The overall objective of the implementation phase has been to produce a solution based on the development of traffic and environmental monitoring units and selecting of a processing platform and components already present on the market and at the same time suitable for automotive applications. For the selection of a suitable off-the-shelf embedded platform and of the electronic components, the latest automotive standards and technological advancements have been taken into account.

Basic research and future components have not been considered as the final prototype systems will have to be suitable for commercialisation after INGEGREEN.

In Task 4.2 a complete mobile system prototype suitable for automotive application has been produced. The physical prototypes will be the input for the next Task 4.3 System integration where a mobile systems with full functionalities which will allow vehicles to have traffic and environmental detection capabilities, as well as real-time communication functionalities, in particular between the On-board telematic unit and the Vehicle front-end and subsequently to the Supervisor Center system will be integrated in vehicles and tested.

The real result in Action 4 is the production and integration of the physical prototypes. Each prototype unit consists of physical HW and SW and will have to perform the specified functionalities. The document deliverables of Action 4 are the accompanying documentation which summarise and describe the main steps needed to deliver the physical prototypes.

This document deliverable contains the second output of Task 4.2, namely a description of the on-board environmental monitoring unit prototype.

2 Implementation of the On-board environmental unit prototype

2.1 Implementation of the On-board environmental unit prototype

Restricted Information.

For further information please contact the appropriate specialists of AIT Austrian Institute of Technology GmbH.

2.2 Interface description of the Environmental monitoring unit

Several interfaces of the Environmental unit are the same as the interfaces of the Traffic unit:

- USB connection: see chapter 2.2.2 of deliverable P.4.2.1
- GPS antenna connection: see chapter 2.2.3 of deliverable P.4.2.1
- Power supply connection: see chapter 2.2.4 of deliverable P.4.2.1
- External expansion connection: see chapter 2.2.5 of deliverable P.4.2.1
- Internal expansion connection: see chapter 2.2.6 of deliverable P.4.2.1
- Programming connection: see chapter 2.2.7 of deliverable P.4.2.1

2.2.1 Air interface

The air interface is composed of two air tube connectors (Figure 10):

- AIR In
- AIR Out

Air tubes with 5 mm inner diameter have been used. The length of the air-tube depends on the mounting position of the Environmental unit inside the vehicle and the wanted position of the air inlet. The length of the aspiration air-tube has a big importance also for the SW, because the time delay between the measurement air is aspirated at the air inlet and the air arrives at the sensors must be calculated and corrected when the measured pollution value is matched to a geographical location.

The AIR Out tube can also be omitted. In this case the aspirated air will be emitted inside the vehicle (similar to the fresh air input of the vehicle for passengers and driver).

Figure 3: Air interface

Conclusions

The overall objective of the implementation phase has been to produce a solution based on the development of traffic and environmental monitoring units as well as to select a processing platform and components already present on the market and at the same time suitable for automotive applications. For the selection of a suitable off-the-shelf embedded platform and of the electronic components, the latest automotive standards and technological advancements have been taken into account.

The results of Action 4 have been the production and integration of the physical prototypes. Each prototype unit consists of physical HW and SW that will have to perform the specified functionalities. The three prototypes are the On-board traffic monitoring unit prototype, the On-board environmental monitoring unit prototype and the On-board telematic unit prototype.

The main steps of the implementation phase that are common to the three prototypes are the following:

- Electronic schematic design
- PCB layout design
- PCB production
- Component purchase
- Electronic component mounting
- Labelling and testing and of mounted PCBs
- Housing and integration
- Power supply connection
- USB connection
- Interface description unit

Specific step for the Implementation of the On-board environmental unit prototype have been necessary, namely:

- Air interface (Inlet and Outlet pipe connection)
- GPS antenna connection (Optional)

Once the three prototypes have been completed the integration of the complete INTEGREEN mobile system has been executed on board of the AIT test vehicle.

Subsequently several Field Tests have been successfully executed in Vienna as well as in Bolzano where the End-to-End functionalities of the Mobile System have been verified.

Appendix A: Acronyms and Definitions

FW: Firmware

HW: Hardware

lpm: litre per minute

Pb: lead

PCB: Printed Circuit Board

SW: Software