



D3.3: System Integration Document

MITRA - FP6 - STREP (511361)

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Glossary

Alert code	Internal system code transmitted in case an alert is generated by the system. It will be generated in two situations: <ul style="list-style-type: none"> • when detecting a cargo parameter is out-of-limits • when the vehicle driver presses the panic button
Carrier	The enterprise, which carries out the transport operation with or without transport contract. [RD4]
Container	Receptacle prepared for keeping each individual cargo. It is designed for the specific cargo carriage.
Hazard identification number	Indicates the potential risk represented by the cargo. It consists of two or three figures indicating the following hazards: <ul style="list-style-type: none"> 2 Emission of gas due to pressure or chemical reaction 3 Flammability of liquids (vapours) and gases or self-heating liquid 4 Flammability of solids or self-heating solid 5 Oxidizing (fire-intensifying) effect 6 Toxicity 7 Radioactivity 8 Corrosivity 9 Risk of spontaneous violent reaction <p>Doubling of a figure indicates an intensification of that particular hazard. Where the hazard associated with a substance can be adequately indicated by a single figure, this is followed by a zero.</p> <p>If a hazard identification number is prefixed by letter 'X', this indicates that the substance will react dangerously with water.</p> <p>For further details see [RD5] Part 5-section 5.3.2.3.1.</p>
International Chemical Safety Cards (ICSCs)	International programme on Chemical Safety Project. ICSCs project is an undertaking of the International Programme on Chemical Safety (IPCS). An ICSC summaries essential health and safety information on chemicals. ICSCs are not legally binding documents, but consist of a series of standard phrases, mainly summarising health and safety information collected, verified and peer reviewed by internationally recognised experts. Taking into account advice from manufactures and Poison Control Centres. <p>http://www.ilo.org/public/english/protection/safework/cis/products/icsc/dtasht/intro.htm</p>
Multi-element vehicle	Dangerous goods are transportation of interest in MITRA is performed by road and rail. Each of this vehicles are composed of different elements: <ul style="list-style-type: none"> – Road transportation: tractor and trailer. – Rail transportation: locomotive and wagons. <p>The transport will carry part of the system (the On-Board Terminal/s) since it must send current information related to the transport, such as the current position and dynamic cargo information. According to the “multi-element vehicle” there will be two types of OBT:</p> <ul style="list-style-type: none"> – Master OBT: located on the vehicle puller (tractor or locomotive) – Element OBT: located in each element of the vehicle (trailer or wagon) with input signals to receive the information from the containers.
Packing	Group to which, for packing purposes, certain substances may be assigned in

Group	<p>accordance with their degree of danger. The packing groups have the following meaning, which are explained more fully in Part 2 of [RD5]. [RD4]</p> <ul style="list-style-type: none"> • Packing group I: Substances presenting high danger. • Packing group II: Substances presenting medium danger. • Packing group III: Substances presenting low danger.
Pre-planned route	<p>It contains data and time of departure, expected stops, origin and final destination. This route shall agree with the schedule according to the routes to transport dangerous goods.</p>
Transport document	<p>Information about the transport given by the consignor. See chapter 5.4 and part 3 of [RD4].</p>
Transport Emergency Cards (TREMcards)	<p>Cards providing information of the initial actions to be taken in a crisis situation for each specific dangerous substance.</p> <p>http://www.tremcards.com</p>
UN number	<p>Four-figure identification number of the substance or article taken from the UN Model Regulations. [RD4]</p>
Vehicle number	<p>ID Unique vehicle identification number per transport generated automatically by the system per substance transported.</p>
Virtual Identity Card	<p>Virtual card displayed to the operator that contains relevant information about the transport. This card can be displayed on operator request in either monitoring and crisis situations. It contains the following information:</p> <ul style="list-style-type: none"> • Vehicle ID. • Vehicle license number <i>e.g.: 9452BCD</i>. • Carrier (Vehicle company owner name). • Products permitted (for transportation to the vehicle). • Driver license number <i>e.g.: 0845732IM</i>. • Driver clearances to carriage certain transport. • Pre-planned route. • Cargo UN number. <i>e.g.: for petrol 1203</i>. • Cargo Hazard Identification number. <i>e.g.: for petrol 33</i>. • Packing group. <i>e.g.: for petrol II</i>. • Current cargo amount. • Cargo recommended status (temperature, pressure) during the monitoring and alert situation. <i>e.g.: T = 20 K, P = 1 bar</i> (considering international system of measures, SI). • International Chemical Safety Card number. <i>e.g.: for petrol 1400</i>. • Type of vehicle transporting dangerous goods. <i>e.g. partitioned cylinder</i>.

Acronyms

AD	Applicable Document
ADNR	Regulation for the Carriage of dangerous substances on the Rhine
ADR	European agreement concerning the international carriage of dangerous goods by Road
CON	Construction
CS	Communication Server
DEI	Data Exchange Infrastructures
DoW	Description of Work
EDS	External Data Sources
EGNOS	European Geostationary Navigation Overlay System
ESA	European Space Agency
ESDI	European Spatial Data Infrastructure
EU	European Union
FS	Functional Specification
GEN	General
GIS	Geographical Information System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global Standard for Mobile Communications
GUI	Graphical User Interface.
HRA	Human Reliability Analysis.
HTML	Hypertext Markup Language.
ICSCs	International Chemical Safety Cards.
IDSS	Intelligent Decision Support System.
IMEI	International Mobile Equipment Identification
INSPIRE	INfrastructure for SPatial InfoRmation in Europe.
IP	Internet Protocol
ISO	International Standards Organisation.
MITRA	Monitoring an intervention for the transportation of dangerous goods.
MW&A	Monitoring, Warning and Alert.
N/A	No applicable.
NTBI	Not to be implemented.
OBT	On-Board Terminal.
RD	Reference Document.
REG	Regulation.
RID	Regulation concerning the International carriage of dangerous goods by Rail.
RID	Review Item Discrepancy.



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RKP	Risk Knowledge Platform.
SAMUR	Servicio de Asistencia Municipal de Urgencia y Rescate (Medical Service body of Madrid council)
SDR	System Definition Review.
SMS	Short Message Service
STREP	Specific Targeted Research Project
TBD	To be defined.
TBI	To be implemented.
TBPI	To be partially implemented
TBS	To be simulated.
TCP	Transmission Control Protocol
TN	Technical Note.
UMT	User Monitoring Terminal.
UN	United Nations.
UR	User Requirement.
URR	User Requirements Review.
WGS	World Geodetic System.
WP	Work-Package.

1 Introduction

1.1 Introduction

This document contains the definition of the tests to be performed in order to verify the correct behaviour of the MITRA system once all the subsystems that make it up have been fully integrated.

The successful completion of the test scenario proposed and defined within this document allows getting the system ready for guaranteeing the correct performance of the field trials that will be run during the MITRA validation campaigns.

1.2 Purpose and scope of the document

The present document constitutes the deliverable “D3.3 System Integration Document” for the MITRA project. This deliverable is a contractual document.

1.3 Structure of the document

The present document is structured as follows:

- Section 1 describes the context of D3.3 in the project, its objective and the applicable and reference documents.
- Section 2 presents the functional specifications verification plan outline.
- Section 3 presents the results concerning the functional specification verification.
- Section 4 presents the verification method for the non functional specifications.

1.4 Applicable and reference documents

1.4.1 Applicable documents

- AD1** Contract n°FP6-511361, MITRA (Monitoring and Intervention for the TRANsportation of Dangerous Goods), Commission of the European Communities, Information Society Directorate General, Specific Targeted Research Project (STREP), date of signature 26 July 2004.
- AD2** Annex I to MITRA contract, Description of Work, 28 May 2004.
- AD3** Annex II to MITRA contract, General conditions, 23 October 2003.
- AD4** Consortium Agreement for MITRA Project (contract n°511361) – 6th Framework Programme of the European Community (2002-2006) Information Society Directorate-General - Version 1.0 of 14 July 2004, revision 01 of 16 August 2004.
- AD5** MITRA Kick-Off Minutes of Meeting (Steering Committee), MITRA/MM/M3S/WP0/KO-04-09-28-29/v1.0 – version 1.0.
- AD6** D1.1b MITRA User Requirements, MITRA-D1.1b-ISDEFE-WP1-User Requirements-V2.0, 28/02/2005.
- AD7** D1.2 MITRA Functional Specifications, MITRA-D1.2-ISDEFE-WP1-Functional Spec-V2.0, 25/05/2005.
- AD8** D3.1 MITRA Architectural Design Document, MITRA-D3.1-DEIMOS-WP3.1-ADD-V2.1, 06/06/2005.
- AD9** D3.1b MITRA Interface Control Document, MITRA-D3.1b-DEIMOS-WP3.1-ADD-I-3.1, 07/12/2005.



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1.4.2 Reference documents

- RD1** MITRA Minutes of Meeting MITRA architecture Workshop, MITRA/MoM/M3S/Architecture WS Madrid/v0.1.
- RD2** D1.1.a 1st MITRA Workshop Report, version 1.0 31/01/2005.
- RD3** European agreement concerning the international carriage of dangerous goods by Road. (ADR) 2005 Part 1. "General provisions and provisions concerning dangerous goods substances and articles". <http://www.unece.org/trans/danger/publi/adr/adr2005/English/Part1.pdf> - 589k - 26/Jan/2005.
- RD4** European agreement concerning the international carriage of dangerous goods by Road. (ADR) 2005. <http://www.unece.org/trans/danger/publi/adr/adr2005/English>
- RD5** SDR RIDs regarding the ADD

2 Verification Plan Outline

The verification of the MITRA system is based on the successful completion of the following activities:

1. Execution of unit tests for verifying the software components of each individual subsystem.
2. Integration of the subsystems already verified as individual entities and verification of MITRA system interfaces.
3. System tests execution mainly by performing the required data exchange between subsystems.
4. Definition of a test scenario that covers the verification of the functional specifications.

The MITRA system verification allows ensuring that the system is ready for becoming operational and therefore ready for running the field trials during the validation campaigns. The main objective of the MITRA system prototype validation is to demonstrate in front of the end users and experts all the functionalities identified during the system specification phase. Following this approach, the last step of the verification phase is based on verifying the specifications that are directly linked to the interaction between the end users and the system, i.e. the functional specification related to the UMT.

For the specifications that are not strictly considered as “functional”, the verification will be made by analysis.

The following sections present the results of the MITRA verification. First for the “functional” specifications (section 3) and then for the ones called “Non functional” specifications (section 4).

3 Functional Specifications Verification

3.1 Introduction

As stated above, the successful verification of the functional specifications related to the UMT involves that it could be considered that the system properly works as a whole.

The section 3.2 presents the description of the UMT specifications together with the underlying functions (specifications related to the rest of subsystems) that are automatically verified when each one of the UMT is verified.

The section 3.3 presents the verification scenario to be performed by defining the information that will be provided by the OBT.

The section 3.4 presents the result of the verification; this is the outputs observed from the execution of the scenario.

3.2 UMT Functional Specifications Test Scenario

Functional Specification	Impl.	Other FS covered	Comments
<p>UMT 0010</p> <p>The UMT application shall be based on background processes and graphical user interfaces that shall allow to perform the following main operations:</p> <ul style="list-style-type: none"> Monitoring the transportation of dangerous goods by road and rail within a delimited area. This function will make use of a GIS (2D and 3D). Monitoring and managing of alert and crisis situations. Provide the operator with support to decisions in case of crisis situations. 	TBI	GEN 0010, OBT 0010, OBT 0020, OBT 0031, OBT 0070, DEI 0030	OBT 0070: GPS position determination and SMS transmission takes longer than 1 sec.



Functional Specification		Impl.	Other FS covered	Comments
UMT 0030	<p>The UMT shall provide a menu option for the operator to request the visualization of the current position of the selected vehicles, which shall be represented on the corresponding map into a GUI. The vehicles on trip shall be represented in a list from where the operator could select the ones to be monitored. The list shall present the main features regarding the transport, e.g. type of vehicle and type of good and amount. The vehicles shall be seen as an icon moving on the map (specific for trucks or trains) that will have some associated information that shall be showed if the operator requests it. The information showed will be:</p> <ul style="list-style-type: none"> ▪ The Vehicle ID number. ▪ The positioning information following the stabilised standards for navigation information, e.g.: Road and rail: Official name / Kilometric point / Heading. Street: Street name / number of the street. ▪ A label containing the UN number, the CAS number and the Cargo Hazard Identification number per substance transported. ▪ The UMT shall show the information within 2 <u>seconds</u> after receiving a new package of information from the DEI. 	TBI	OBT 0020, OBT 0030, OBT 0031, DEI 0020, DEI 0030, DEI 0040, CS 0010, CS 0020	
UMT 0040	<p>The UMT shall automatically show the current position or the last known position of the vehicles that has originated an alert situation represented on the corresponding map into a GUI and the potential area affected. The potential area affected will be provided by the RKP through a DEI interface.</p>	TBI	OBT 0020, OBT 0030, OBT 0031, DEI 0020, DEI 0030, DEI 0040, DEI 0060, CS 0010, CS 0020, RKP 0070	

Functional Specification		Impl.	Other FS covered	Comments
UMT 0050	<p>Under operator request, the UMT shall show on a GUI the content of the identity card provided by a DEI interface from one specific vehicle. The following information will be showed:</p> <ul style="list-style-type: none"> ▪ Vehicle⁶ ID [see glossary]. ▪ Vehicle license number. ▪ Carrier (Vehicle company owner name) [see glossary]. ▪ Products permitted (for transportation to the vehicle). ▪ Driver license number. ▪ Driver clearances to carriage certain transport. ▪ Pre-planned route. [see glossary]. ▪ Cargo UN number [see glossary]. ▪ Cargo CAS number [see glossary]. ▪ Cargo Hazard Identification number [see glossary]. ▪ Packing group [see glossary]. ▪ Current cargo amount. ▪ Cargo recommended status (temperature, pressure) during the monitoring and alert situation. <i>e.g.: T = 93,15K, P = 1 bar</i> (considering international system of measures, SI). ▪ International Chemical Safety Card number. [see glossary]. ▪ Type of vehicle transporting dangerous goods. <p>Taking into account the “<i>multi-element vehicle</i>” concept there are two different options:</p> <ul style="list-style-type: none"> ▪ When a road related information is requested, the UMT shall show a list of the different containers carried in the trailer. He/she will be able to select a container and the UMT will show the specific identity card for the substance transported in the container chosen. ▪ When a train related information is requested, the UMT shall show a list of the different wagons that make up the convoy. The operator will select each wagon and the UMT will show the different containers that are being transported by the wagon. The operator will be able to request the specific identity card of the selected container. <p>⁶ See definition presented in section 3.4.1.</p>	TBI	DEI 0020, DEI 0110	

Functional Specification		Impl.	Other FS covered	Comments
UMT 0070	Under operator request, the UMT shall show on a GUI the following information provided by a DEI interface: <ul style="list-style-type: none"> Information given in the transport document filled in by the consignor. See chapter 5.4 and part 3 of [RD4]. 	TBI	DEI 0020, DEI 0130	
UMT 0080	Under operator request, the UMT shall show on a GUI the following information provided by a DEI interface: <ul style="list-style-type: none"> Information contained in the Transport Emergency Card [see glossary] for the substances involved in the accident. This information will be stored in the RKP data base. 	TBI	DEI 0020, RKP 0060	
UMT 0090	The UMT will incorporate a GIS that shall make possible to present on a GUI the geo-referenced information organized in subject matter layers. Following layers could be selected for visualization: <ul style="list-style-type: none"> Geographical and physical information (particular hydrography, orography and wind maps (seasonal prevailing winds)). Population distribution, e.g. zones, buildings, commercial centres, schools, hospitals and any other relevant. Social structures. 24 distinct uses of land. Road and rail facilities and access. Ecological areas with different degree of sensitivity. 	TBPI		
UMT 0100	Under operator request, the UMT shall show information on extraordinary events at the monitored area. This information will reside in external databases, and will be gathered and provided by DEI. The information will be represented on the map at the corresponding coordinates when available.	TBI	DEI 0020, DEI 0080	
UMT 0110	The UMT shall show the current system time on the main GUI.	TBI		

Functional Specification		Impl.	Other FS covered	Comments
UMT 0130	Under operator request, the UMT shall show on a GUI the potential hazards represented by a good being transported by a given vehicle selected by the operator. The information will be provided by the RKP through a DEI interface and will follow the nomenclature and order established in the European Standards.	TBI	DEI 0020, DEI 0220, RKP 0060	
UMT 0140	Under operator request, the UMT shall show on the GUI the potential area affected around the corresponding vehicle, which will be provided by the RKP through a DEI interface.	TBI	DEI 0020, RKP 0060	
UMT 0160	The DEI shall release an interface for the UMT to notify asynchronous alert situation raised by the OBT. Each time a warning is received, the UMT will: <ul style="list-style-type: none"> ▪ Trigger automatically an alert situation. 		OBT 0020, OBT 0030, OBT 0031, DEI 0020, DEI 0030, DEI 0040, DEI 0060, DEI 0100, CS 0010, CS 0020	The alert is already indicated by a flag set by the OBT to notify DEI and the UMT about the crisis situation
UMT 0170	The UMT shall provide a menu option for the operator to trigger an alert manually. The UMT will make use of a DEI service for recording the occurrence of the alert situation.	TBI	DEI 0070	This service is used not only for manual alerts but for any kind of alert that had to be raised by the UMT, for instance when the vehicle is nearby or crossing a tunnel
UMT 0180	The UMT shall automatically detect that a vehicle is nearby or crossing a tunnel.	TBI	OBT 0020, OBT 0030, OBT 0031, DEI 0020, DEI 0030, DEI 0040, DEI 0060, CS 0010, CS 0020	
UMT 0200	Under operator request, the UMT shall provide a GUI for the operator to get the list of hospitals into and closed to the monitoring area. This list shall contain the hospital services and equipments providing information of those hospitals prepared for receiving contaminated victims.	TBI	DEI 0020, DEI 0090	
UMT 0210	The UMT shall show on the GUI the time when the alert situation has been raised.	TBI		



Functional Specification		Impl.	Other FS covered	Comments
UMT 0220	In case of a alert situation, the UMT shall automatically show on the GUI the potential area affected [see glossary] around the vehicle that has originated the crisis situation together with the expected impacts on that area caused by the nature of the cargo being transported by the vehicle and the characteristics of the area. The RKP will process all this information and will provide the UMT with the corresponding risk and impact assessment.	TBI	DEI 0020, DEI 0050, DEI 0060, RKP 0060	
UMT 0230	In case of a alert situation, the UMT shall automatically show an explicit reference on the GUI indicating when the vehicle is inside/nearby a tunnel.	TBI		
UMT 0240	Under operator request, the UMT shall provide a GUI for the operator to introduce extra information related to the crisis situation collected from any source. In particular, the main sources will be the first responder present at the accident scenario and the driver that will pass the information on to the MITRA operator via a voice phone call. The following fields could be filled by the operator with the information obtained from the crisis scenario: <ul style="list-style-type: none"> ▪ Type of accident: collision, overturning, derailing, firing, product leaking. ▪ Visual status of the cargo: in tank, burning, leaking. ▪ Possible number of victims and the type of damages observed on most of them. ▪ Weather conditions of the location of the accident: wind speed, wind direction, approximate temperature, raining or snowing. 	TBI	DEI 0160	

Functional Specification		Impl.	Other FS covered	Comments
UMT 0250	Under operator request, the UMT shall provide a GUI for the operator to get all the information related to the crisis situation gotten from the first responders and that has been previously entered manually. The information that will be provided will be the following: <ul style="list-style-type: none"> ▪ Vehicle ID number. ▪ Localization. ▪ Type of accident. ▪ Visual status of the cargo 7. ▪ Possible number of victims. ▪ Weather conditions of the location of the accident. 	TBPI	DEI 0190	
UMT 0260	Under operator request, the UMT shall assess and show on a GUI the possible effects caused on the victims of the crisis situation for helping the operator to decide what intervention teams have to be warned and what material they should take. This information will be provided by the RKP through a DEI interface.	TBI	DEI 0020, DEI 0050, DEI 0060, DEI 0200, RKP 0060,RKP 0090	
UMT 0270	Under operator request, the UMT shall request to DEI and shall show on a GUI the information regarding nearby equipment and material available to decant the cargo.	TBI	DEI 0020, DEI 0170	
UMT 0280	Under operator request, the UMT shall request to DEI and shall show on a GUI the information on disposal facilities in the vicinity to be potentially used for cargo disposal.	TBI	DEI 0020, DEI 0180	
UMT 0290	Under operator request, the UMT shall show on a GUI a list of actions recommended to be taken according to the established action plan. This action plan shall be suited to the type of accident and particularized to the region in which the accident has been detected. This information will be provided by the RKP through a DEI interface.	TBPI	DEI 0210, RKP 0010, RKP 0060, RKP 0090	
UMT 0300	Under operator request, a UMT process shall determine the recommended emergency treatment to the victims and will show it on a GUI. The recommended emergency treatment will be determined according to the damages of the victims. This information will be provided by the RKP through a DEI interface.	TBI	DEI 0211, RKP 0060	



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Functional Specification		Impl.	Other FS covered	Comments
UMT 0310	Under operator request, the UMT shall show on a GUI the possible hazards and effects related to the crisis situation. The information related to the hazards and their associated effects will be provided by the RKP.	TBI	DEI 0210, RKP 0060	



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3.3 Test Scenario Description

T0+XX minutes	TIME (UTC)	LAT	LONG	AMNT (kg)	P (hPa)	T (K)	SHOCK (Unit TBD)	VERT (* (°)	ALERT GENERATED BY OBТ					
									Panic button	Cargo alert	Pressure alert	Temp alert	Shock alert	Vert alert
T0	20051118153725	43,560776	2,272081	24000	1020	28 4	0,0	90	no	no	no	no	no	no
T0+1	20051118153825	43,560743	2,272033	24000	1020	28 4	0,0	90	no	no	no	no	no	no
T0+2	20051118153925	43,560108	2,272443	24000	1020	28 4	0,0	90	no	no	no	no	no	no
T0+3	20051118154025	43,557473	2,275070	24000	1020	28 4	0,0	90	no	no	no	no	no	no
T0+4	20051118154125	43,556221	2,277618	24000	1020	28 4	0,0	90	no	no	no	no	no	no
T0+5	20051118154225	43,552251	2,276275	24000	1020	28 4	0,0	90	no	no	no	no	no	no
T0+6	20051118154325	43,548378	2,273800	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+7	20051118154425	43,544908	2,271956	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+8	20051118154525	43,541905	2,268006	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+9	20051118154625	43,539903	2,264483	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+10	20051118154725	43,538536	2,263403	24000	1020	28 3	0,0	90	no	no	no	no	no	no



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T0+XX minutes	TIME (UTC)	LAT	LONG	AMNT (kg)	P (hPa)	T (K)	SHOCK (Unit TBD)	VERT (* (°)	ALERT GENERATED BY OB T					
									Panic button	Cargo alert	Pressure alert	Temp alert	Shock alert	Vert alert
T0+11	20051118154825	43,549857	2,245326	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+12	20051118154925	43,552078	2,232014	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+13	20051118155025	43,552068	2,221777	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+14	20051118155125	43,553792	2,209830	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+15	20051118155225	43,553022	2,190382	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+16	20051118155308	43,552390	2,169915	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+17	20051118155408	43,552600	2,165056	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+18	20051118155508	43,553326	2,155323	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+19	20051118155608	43,554071	2,145401	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+20	20051118155708	43,554791	2,135738	24000	1020	28 3	0,0	90	no	no	no	no	no	no
T0+21	20051118155808	43,555373	2,127723	24000	1023	29 0	0,0	90	no	no	no	no	no	no
T0+22	20051118155908	43,555826	2,121526	24000	1027	29 7	0,0	90	no	no	no	no	no	no
T0+23	20051118160008	43,556130	2,116696	24000	1033	30 6	0,0	90	no	no	no	no	no	no
T0+24	20051118160108	43,553771	2,115405	24000	1040	31 3	0,0	90	no	no	no	no	no	no



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T0+XX minutes	TIME (UTC)	LAT	LONG	AMNT (kg)	P (hPa)	T (K)	SHOCK (Unit TBD)	VERT (* (°)	ALERT GENERATED BY OB T					
									Panic button	Cargo alert	Pressure alert	Temp alert	Shock alert	Vert alert
T0+25	20051118160208	43,553681	2,110360	24000	1050	32 1	0,0	90	no	no	no	no	no	no
T0+26	20051118160308	43,555223	2,103281	24000	1064	33 0	0,0	90	no	no	no	yes	no	no
T0+27	20051118160408	43,557041	2,096655	24000	1074	33 5	0,0	90	no	no	yes	yes	no	no
T0+28	20051118160508	43,557773	2,093586	24000	1074	33 5	0,0	90	no	no	yes	yes	no	no
T0+29	20051118160608	43,557773	2,093586	24000	1074	33 5	0,0	90	no	no	yes	yes	no	no
T0+30	20051118160708	43,557773	2,093586	24000	1074	33 5	0,0	90	no	no	yes	yes	no	no
T0+31	20051118160808	43,558036	2,068460	24000	1074	33 5	0,0	90	no	no	yes	yes	no	no
T0+32	20051118160908	43,558153	2,059220	24000	1074	33 5	0,0	90	no	no	yes	yes	no	no
T0+33	20051118161008	43,558476	2,050395	24000	1074	33 5	0,0	90	no	no	yes	yes	no	no
T0+34	20051118161108	43,561736	2,045235	24000	1074	33 5	0,0	90	no	no	yes	yes	no	no
T0+35	20051118161208	43,565743	2,040660	24000	1064	33 0	0,0	90	no	no	no	yes	no	no
T0+36	20051118161308	43,567276	2,034950	24000	1064	32 7	0,0	90	no	no	no	yes	no	no
T0+37	20051118161408	43,567980	2,030685	24000	1064	32 4	0,0	90	no	no	no	yes	no	no
T0+38	20051118161508	43,568013	2,024770	24000	1050	32 1	0,0	90	no	no	no	no	no	no



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T0+XX minutes	TIME (UTC)	LAT	LONG	AMNT (kg)	P (hPa)	T (K)	SHOCK (Unit TBD)	VERT (* (°)	ALERT GENERATED BY OBТ					
									Panic button	Cargo alert	Pressure alert	Temp alert	Shock alert	Vert alert
T0+39	20051118161608	43,568195	2,020008	24000	1040	31 3	0,0	90	no	no	no	no	no	no
T0+40	20051118161708	43,570051	2,016590	24000	1033	30 6	0,0	90	no	no	no	no	no	no
T0+41	20051118161808	43,571061	2,014071	24000	1027	29 7	0,0	90	no	no	no	no	no	no
T0+42	20051118161908	43,572166	2,012003	24000	1023	29 0	1,0	90	no	no	no	no	yes	no
T0+43	20051118162008	43,573126	2,010241	24000	1020	28 3	0,0	0	yes	no	no	no	no	yes
T0+44	20051118162108	43,573126	2,010241	23760	1020	28 3	0,0	0	no	yes	no	no	no	yes
T0+45	20051118162208	43,573126	2,010241	23520	1020	28 3	0,0	0	no	yes	no	no	no	yes
T0+46	20051118162308	43,573126	2,010241	23280	1020	28 3	0,0	0	no	yes	no	no	no	yes
T0+47	20051118162408	43,573126	2,010241	23040	1020	28 3	0,0	0	no	yes	no	no	no	yes
T0+48	20051118162508	43,573126	2,010241	22800	1020	28 3	0,0	0	no	yes	no	no	no	yes
T0+49	20051118162608	43,573126	2,010241	22560	1020	28 3	0,0	0	no	yes	no	no	no	yes
T0+50	20051118162708	43,573126	2,010241	22320	1020	28 3	0,0	0	no	yes	no	no	no	yes
T0+51	20051118162808	43,573126	2,010241	22080	1020	28 3	0,0	0	no	yes	no	no	no	yes
T0+52	20051118162908	43,573126	2,010241	21840	1020	28 3	0,0	0	no	yes	no	no	no	yes



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T0+XX minutes	TIME (UTC)	LAT	LONG	AMNT (kg)	P (hPa)	T (K)	SHOCK (Unit TBD)	VERT (*) (°)	ALERT GENERATED BY OBТ					
									Panic button	Cargo alert	Pressure alert	Temp alert	Shock alert	Vert alert
T0+53	20051118163008	43,573126	2,010241	21600	1020	28 5	0,0	0	no	yes	no	no	no	yes
T0+54	20051118163108	43,573126	2,010241	21360	1020	29 1	0,0	0	no	yes	no	no	no	yes
T0+55	20051118163208	43,573126	2,010241	21120	1020	29 6	0,0	0	no	yes	no	no	no	yes
T0+56	20051118163308	43,573126	2,010241	20880	1020	30 1	0,0	0	no	yes	no	no	no	yes
T0+57	20051118163408	43,573126	2,010241	20640	1020	30 6	0,0	0	no	yes	no	no	no	yes
T0+58	20051118163508	43,573126	2,010241	20400	1020	31 2	0,0	0	no	yes	no	no	no	yes
T0+59	20051118163608	43,573126	2,010241	20160	1020	32 0	0,0	0	no	yes	no	no	no	yes

Table 3-1 Test Scenario OBТ data

(*):

90°=truck vertical

0°=truck lying on its side

-90°=truck upside down

3.4 Test Scenario Execution

Time	Situation	passed/ failed	FS Verified
Prerequisite	Check that it is possible to remotely configure the OBT.	Passed	CS 0030
Prerequisite	Check that the subsystems are synchronized among themselves (they may use an external time server for synchronization).	Passed	DEI 0010
T0	A truck, with a cargo tank carrying 24 tons of acrylo-nitrile, leaves the city of Castres (France) and drives towards the city of Toulouse (France). The truck is monitored by the UMT.	Passed	UMT 0010 UMT 0030 UMT 0040 UMT 0090 UMT 0110
T0+1mn	The UMT operator can use the zooming feature of the HMI.	Passed	
T0+2mn	The UMT operator displays the hospitals in the area. The closest hospital is the "CGX hospital".	Passed	UMT 0200
T0+4mn	The UMT operator displays the information about the Virtual Identity Card of the vehicle: <ul style="list-style-type: none"> • Vehicle ID. • Vehicle license number. • Carrier (Vehicle company owner name). • Products permitted • Driver license number • Driver clearances to carriage certain transport. • Pre-planned route. • Cargo UN number. • Cargo Hazard Identification number. • Packing group. • Current cargo amount. • Cargo recommended status (temperature, pressure) • International Chemical Safety Card number • Type of vehicle transporting dangerous goods. 	Passed	UMT 0050

Time	Situation	passed/ failed	FS Verified
T0+6mn	<p>The UMT operator displays the Transport Document</p> <ul style="list-style-type: none"> • Vehicle company owner name • Vehicle Type. • Tare (Kg, total vehicle tare). • Item List (describes each one of goods with the followings attributes). <ul style="list-style-type: none"> ○ Cargo UN number ○ Technical Name. ○ Packing group. ○ Place of Loading. ○ Loading Time. ○ Place of Discharge. ○ Discharge Time. ○ Initial cargo amount. ○ Cargo Hazard Identification number [see glossary]. ○ Cargo recommended status (temperature, pressure) 	Passed	UMT 0070
T0+11mn	The UMT operator displays the characteristics of the cargo transported (acrylo-nitrile), i.e. the potential hazards, together with the potential area affected (worst case) associated to the cargo nature.	Passed	UMT 0080 UMT 0130 UMT 0140
T0+17mn	The UMT operator displays the values of the OBT sensors (P, T, shock, verticality, argo amount).	Passed	UMT 0010
T0+21mn	For some reason, the temperature of the acrylo-nitrile cargo starts to increase.	Passed	
T0+26mn	The temperature of the acrylo-nitrile cargo is above the MAX threshold (323°K). Consequently, the OBT triggers automatically an overheat alert, which is notified on the HMI. The HMI also displays the potential area affected by this alert.	Passed	UMT 0010 UMT 0040
T0+27mn	Pressure alert notified by OBT and displayed on the HMI.	Passed	UMT 0010 UMT 0040 UMT 0210
T0+28mn	The truck enters a tunnel , which is located on the road between Castres and Toulouse. The tunnel alert is notified by the UMT and displayed on the HMI (the temperature of the cargo remains above the MAX threshold).	Passed	UMT 0180 UMT 0230
T0+30mn	The UMT operator, who is informed about the tunnel alert, assesses the alert situation. He calls the police on the phone and decides to order the evacuation of the populations in the vicinity of the tunnel.	Passed	UMT 0170 UMT 0230



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Time	Situation	passed/ failed	FS Verified
T0+31mn	The truck continues to drive towards Toulouse. When the truck leaves the tunnel, the tunnel alert disappears on the HMI (the temperature of the cargo remains above the MAX threshold).	Passed	UMT 0170 UMT 0230
T0+34mn	The UMT operator displays again the values of the OBT sensors (P, T, shock, verticality, argo amount). End of pressure alert displayed on the HMI.	Passed	UMT 0010
T0+35mn	The temperature of the acrylo-nitrile cargo starts to decrease.	Passed	UMT 0010
T0+38mn	The temperature of the acrylo-nitrile goes below the MAX threshold value. The overheat alert is closed.	Passed	UMT 0010
T0+40mn	The truck enters in the area close to the Puylaurens market. The UMT operator displays the list of extraordinary events, to show the Puylaurens market.	Passed	UMT 0100
T0+42mn	A car, which is being driven by a old grandmother, appears on the road. This car is on the opposite side of the road, compared to the truck, and is heading rapidly towards the truck. For some reason, the grandmother loses control of her car and there is a strong collision between the truck and the car. Shock alert detected by the OBT and displayed on the HMI.	Passed	UMT 0010 UMT 0040
T0+43mn	Following the collision, the truck falls and is lying on its side. The grandmother is dead. However, the driver of the truck, who is still alive and conscious, is able to trigger an alert, by pressing the panic button on the OBT. The truck is not burning, however the wreck of the car is burning. The panic button alert is displayed on the HMI. Verticality alert triggered by OBT and displayed on HMI (this alert remains activated until the end of the scenario since the truck remains lying on its side).	Passed	UMT 0010 UMT 0040
T0+44mn	Due to the violence of the collision, the cargo tank of the truck is damaged (breach). Consequently, a leakage of acrylo-nitrile appears in the tank, which leads to the apparition of a pool of acrylo-nitrile pool, as well as toxic emanations of acrylo-nitrile. Cargo alert detected by the OBT and displayed on the HMI (leak of cargo through the breach). This alert remains activated until the end of the scenario since the cargo amount is always under the MAX threshold (leak of acrylonitrile).	Passed	UMT 0010 UMT 0040

Time	Situation	passed/ failed	FS Verified
T0+45mn	The operator of the UMT, when he sees the alert on the HMI (triggered by the panic button), displays the exact location of the accident.	Passed	UMT 0010 UMT 0040
T0+46mn	The UMT operator displays the static information provided by the RKP (characteristics of the cargo, mitigation measures, recommended equipment, intervention procedure). Thanks to information provided by the RKP, he decides to send a firemen vehicle on the location of the accident and informs the firemen that the truck was carrying acrylo-nitrile and he also informs them about the characteristics of the cargo transported and intervention procedures.	Passed	UMT 0220
T0+49mn	When the firemen arrive on the location of the accident, they assess the situation (first responder). Then they call the UMT operator on the phone (who decides to trigger a crisis situation) and they provide him with the "first responder" information: <ul style="list-style-type: none"> • Release condition: LEAK • Pool size: MEDIUM • Weather Conditions: <ul style="list-style-type: none"> ○ Day/Night: DAY ○ Cloud cover: MODERATE ○ App wind speed: MEDIUM ○ Environment: NO OPEN COUNTRY 	Passed	UMT 0240
T0+50mn	Thanks to the information provided by the first responder, the UMT interrogates the DEI and the RKP, which provides in return the effect distances associated to the acrylo-nitrile pool, the possible effects caused on the victims, mitigation measures, recommended equipment and intervention procedure. These effect distances are displayed by the UMT. The UMT operator call the firemen and informs them about the effect distances associated to the pool.	Passed	UMT 0040 UMT 0260 UMT 0290 UMT 0310 UMT 0320
T0+51mn	The UMT operator displays the cargo disposal facilities in the area of the accident and the nearby equipment that may be used for supporting the crisis mitigation. The nearest facility is the one of Puylaurens.	Passed	UMT 0270 UMT 0280
T0+53mn	Then the fire, which was so far limited to the wreck of the grandmother car, propagates to the acrylo-nitrile pool. The combustion of the acrylo-nitrile pool leads to emanations of cyanhidric acid, which are highly toxic.	Passed	

Time	Situation	passed/ failed	FS Verified
T0+54mn	The firemen, which are still on the location of the accident, call again the UMT operator on the phone, and provide him with updated “first responder” information about the crisis situation (fire of the pool): <ul style="list-style-type: none"> • Release condition: LEAK and FIRE • Pool size: LARGE 	Passed	UMT 0240 UMT 0250
T0+55mn	The UMT operator then enters this information on the HMI : the DEI is interrogated again, and provides with the effect distances associated to the fire of the pool. Then the UMT operator provides the firemen with these new distances. The new effect distances are displayed by the HMI	Passed	UMT 0040 UMT 0260
T0+56mn	Based on the information about effect distances provided by the UMT operator, the firemen decide to evacuate the perimeter for which a lethal effect has been given by the RKP.	Passed	
T0+59mn	After evacuation of the zone and cleaning of the accident location, the firemen leave the accident location and the UMT operator closes the crisis situation.	Passed	

Table 3-2 Test Scenario Description

3.5 Software Problem Reports

SPR Identifier	Associated scenario step / FS	Description	Suggested Solution	Current Status
SPR 001	T0 / DEI 0010	DEI seems not to be synchronized with a time reference	Deimos to implement the synchronization of the DEI to a web time server	Closed
SPR 002	T0 / UMT 0010	The big red icon for the 3D window is too big and thus confusing.	MW to improve the icon in the 3D window	Closed
SPR 003	T0 / UMT 0010	3D visualization is not convincing in urban areas (more satisfactory in mountain areas).	MW to provide a better resolution picture for urban areas	Closed
SPR 004	T0 / UMT 0040	The pictograms in the RKP static information window are the same whatever the product	COTESA to verify the implementation of a specific pictogram for each product	Closed

SPR Identifier	Associated scenario step / FS	Description	Suggested Solution	Current Status
SPR 005	T0 / UMT 0050	No representation of trains possible in the HMI	CGX to implement the representations of trains in the HMI. Deimos to clearly define the type of vehicle on the ICD.	Closed
SPR 006	T0 + 4 / UMT 0050	The displays for the OBT sensors values are still not clear enough and might sometimes be confusing	CGX to modify the displays for the OBT sensors values: <ul style="list-style-type: none"> Indicate min/max values and current value with units Change the green/red displays to a simple line with cursor <p>INERIS to provide the recommended min/max values (P, T, cargo amount) for all products in the RKP.</p> <p>M3S/KT/INERIS to check the recommended thresholds for shock & verticality</p>	Closed
SPR 007	T0 + 4 / UMT 0050 (with real OBT)	The DEI does not have a VIC completed for MITRA2 and MITRA3 The OBT sensor values for MITRA2 and MITRA3 in the HMI apparently are not updated and keep the same values as for MITRA1	DEIMOS to verify the implementation of VIC for MITRA2 and MITRA3. CGX to check the implementation of OBT sensor values for MITRA2 and MITRA3	Closed
SPR 008	T0 + 6 / UMT 0070	It is not possible to check if the contents of the Transport Document & TREM cards on the HMI are in line with the ADR	ISDEFE to verify that the contents of the Transport Document & TREM cards in the HMI are in line with the ADR	Closed
SPR 009	T0 + 11/ UMT 0130	The pictograms are not displayed in the RKP static information window	M3S to verify the MWA application to display the pictograms	Closed



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SPR Identifier	Associated scenario step / FS	Description	Suggested Solution	Current Status
SPR 010	T0 + 43 / UMT 0010	The DEI apparently does not process the panic button alert provided by CS	DEIMOS to correct the panic button processing in the DEI	Closed
SPR 011	T0 + 49 / UMT 0240	No values for the effect distances were provided by the RKP. The values for the effect distances for the worst case situation were not correct	COTESA to verify the format of the XML file provided by RKP is in line with latest revision of the ICD. DEIMOS to verify that the XSD scheme file (for the RKP part) is in line with the latest revision of the ICD	Closed



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4 Non functional specifications verification

As stated previously in this document, several specifications are not considered strictly as “functional”. Therefore, the verification of such specifications will be made following methods different than performing the corresponding checking of the system behaviour.

The following specifications will be verified and validated together with the associated user requirements by an analysis report to be provided within the D5.5 deliverable, i.e. D5.5 MITRA Evaluation & Impact Assessment Report:

- Construction and Scalability specifications (CON XXXX).
- Security specifications (SEC XXXX).
- Regulations and Standards (REG XXXX).

In addition, for the specifications marked as NTBI (Not To Be Implemented), a set of considerations and recommendations will be provided concerning those within the referred D5.5 document.