Home Office

One Box: Driver and Vehicle Data Management System

Test Protocols

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Contents

Introduction

Purpose

The purpose of this document is to define a set of test protocols which enable the verification of the Driver and Vehicle Data Management System (DVDMS) system requirements.

This document should be read in conjunction with the DVDMS System Requirements (Ref 1) which provides references to this document defining the intended test protocol to be used to satisfy each system requirement. A cross reference between the test protocols and the system requirements they satisfy is also provided in Appendix 1.

The test protocols provide high level guidance on a test use case for each system requirement. They are not designed to provide a list of proposed test equipment or define detailed test procedures as both of these should be developed as part of a DVDMS test methodology.

The Home Office would like to thank MASS Consultants Ltd and ACPO ITS for their work in developing this document.

Document Structure

This document is divided into the following sections:

Section 0 – Introduction: Description of the document, its intended purpose and an overview of the DVDMS.

Section 0 – Test Planning: Aspects to consider during the test planning process.

Section 0 – Test Protocols: Detailed description of the test protocols required to verify the DVDMS system requirements.

Appendix 1 – Test Protocol to System Requirement Cross reference, detailing which test protocol satisfy which system requirements.

DVDMS Overview

The DVDMS is part of the One Box programme being run Home Office CAST to develop a next generation telematics system, aimed at improving safety and reducing costs associated with both the driving and management of emergency vehicle fleets and their drivers. The DVDMS is split into two further sub-systems:

In-Vehicle device

Back Office

The context of the DVDMS is shown in Figure 1.

The purpose of the In-Vehicle device is to collect/store data from the vehicle such as Vehicle, location, driver ID and Behaviour. The data collected by the in-vehicle device is then fed to the Back Office where it can be processed into reports for authorised supervisors, drivers and others to act upon to achieve the required

objectives. Data from the Back Office can also be used to provide feedback to the vehicle for the driver to act upon.

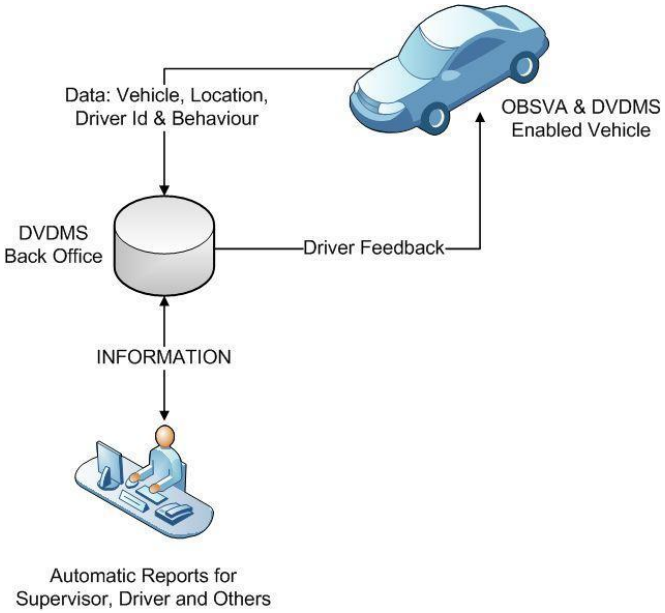

Figure 1: DVDMS System Context

Key to Test Protocol Diagrams

For the block diagrams contained with section 0 of this document the following colour coding key applies:

Test functions are represented in blue.

Users or test operators are represented in green.

The unit under test is represented in grey.

Organisations required for the test protocol are represented in red.

Existing systems required for the test protocol are represented in purple.

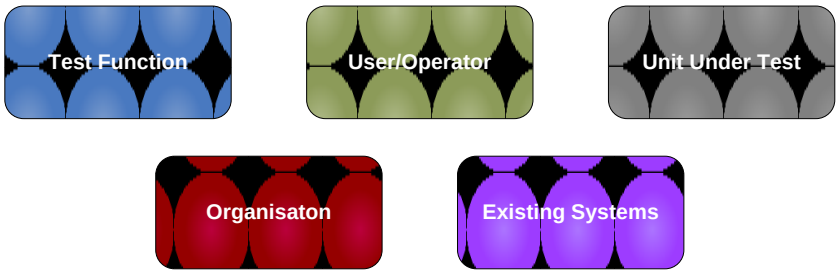

Figure 2: Colour coding key for block diagrams

References

[Ref 1] CAST Publication 01/14
DVDMS System Requirements

[Ref 2] CAST Publication No. 25/14
Single Vehicle Architecture Criteria System Requirements

Glossary of Terms

CAN	Controller Area Network
CAST	Centre for Applied Science and Technology
DVDMS	Driver and Vehicle Data Management System
EMC	Electromagnetic Compatibility
ENV	Environmental
esCAN	Emergency Services Controller Area Network
GSM	Global System for Mobile Communications
MASS	Mass Consultants Ltd
TETRA	Terrestrial Trunked radio
WiFi	Wireless Fidelity
VCRI	Verification Cross Reference Index

Test Planning

Once a requirement to test has been identified the test planning process should begin. This is of the utmost importance. A Functional Test Specification detailing the tests to be carried out, the test environment, pass and fail criteria for each test and the equipment under test, should be produced. This document will dictate the order of the tests, the configuration of the equipment under test and how the tests shall be carried out.

Testing will rigidly follow the Functional Test Specification. No testing outside of the specification will be carried out, but the order of the tests can, with the agreement of the Test Director and Observers, be changed if it is deemed to be beneficial and non disruptive to the overall process.

The following provides more information as to the sections that should be included in the Functional Test Specification.

Test Environment

The test architecture should be included, to show the relationship between the test equipment and the system under test. A description of the architecture and in particular its' connectivity requirements, should also be provided.

The personnel responsible for carrying out the tests should include as a minimum:

Test Director;

Test Operator(s);

Test Observer(s);

It should be assumed (and encouraged) that a representative from the User Organisation will be present during some of the testing to act as additional independent observers.

Schedule of Testing

These should include where possible and applicable:

Date of test;

Time of Pre Test meeting;

Time of first test;

Test finishing time;

Post test wash-up meeting;

Analysis and reporting dead lines, and where necessary date of discussion meeting;

Outcome decision deadline;

Date of test report meeting.

Test Identification

This should describe the total scope of the planned testing and the items to be tested. The items to be tested should be identified and uniquely identified test cases/scripts should be provided.

Test Inspection Analysis and Reporting

This should be performed by a Home Office approved test organisation that possesses the required credentials and expertise to perform the inspection in line with the required standard and provide an analysis report.

It may be necessary to schedule meetings to discuss the findings of the report, in fact it is highly likely that this will be the case should the test outcome not be favourable and subsequently promote contention between testers and equipment manufacturers. If this situation occurs, it is envisaged that the representative from the User Organisation would act as mediator.

Test Readiness Review, Pre and Post Test Meetings

Details of the Test Readiness Review (TRR), pre-test and post-test meetings should be included.

It is recommended that a Pre-Test meeting be convened with the test personnel. This would include any personnel without a specific role but expected to be in the same location as the test. The purpose of the meeting is to ensure everyone is agreed on how the test is expected to run, roles and responsibilities and what action is to be taken upon event deltas, which are seen to be unexpected events that are not part of the test.

It is also recommended that a Post-Test wash-up meeting be convened immediately following the final test. This should be used to gain the opinion from the test personnel on test performance, the need for any retest, assurance of post test timescales.

It is recommended that both meetings are kept as short as possible with a strict agenda.

The Test Director would chair the meetings.

Requirements Traceability

Traceability from each test identified in the Functional Test Specification to the requirements it addresses should be provided through a Verification Cross Reference Index (VCRI). The VCRI should have details of the unique test identifier from the Functional Test Specification against the requirement listed in the Requirements column. It is expected that in a number of cases a single test would satisfy more than one requirement on the VCRI.

Test Protocols

TP1 - Inspection

This test protocol verifies the DVDMS system requirement through inspection. Inspection will fall into one of the following categories:

Inspection of relevant documentation or correspondence to verify the details of the system requirements have been met. This inspection could be performed by either an Approved Test House or The Authority, which is CAST for the purposes of this document.

Physical inspection of a DVDMS component or installation to verify the system requirement has been satisfied. This inspection would normally be performed by a Home Office approved test organisation depending on the requirement and the expertise required to perform the inspection.

The output from this test protocol will be an inspection report(s) performed and witnessed by the appropriate personnel from the approved test organisation

TP2 - Analysis

This test protocol verifies the DVDMS system requirement through analysis. The analysis will fall into one of the following categories:

Analysis of design documentation, where the system requirement is satisfied by a particular element(s) of design. The Approved Test House or other suitable Home Office approved organisations will have to have the required expertise to pass judgement on whether design documentation satisfies the system requirement.

Analysis of previously conducted test results, where a supplier submitting a DVDMS for evaluation has conducted testing of the requirements. The Home Office approved test organisation will be required to analyse and verify the test specification, application of the test specification and ensure the test result evidence satisfies the intended system requirement.

Analysis of design statements, where the supplier may submit design statements declaring compliance with specific requirements. The Home Offcie approved test organisations will have to pass judgement on the suitability of the design statements, ensure they correspond with the design documentation and that satisfactory justification for compliance with the system requirement has been given.

The output from this test protocol will be an analysis report(s) performed and witnessed by the appropriate personnel from the Home Office approved test organisation.

TP3 - Demonstration

This test protocol verifies the DVDMS system requirement through demonstration. The demonstration will fall into one of the following categories:

Demonstration of a function or feature: this should only be used where the requirement cannot or is not economical to verify through test compliance. This should be demonstrated to the Home Offcie approved test organisation.

Demonstration of a procedure, where the requirement is procedural. Compliance should be demonstrated to The Home Offcie test organisation. It is anticipated that the procedure will be documented and the demonstration will then confirm that the anticipated outcome(s) are achieved by following the documented procedure.

The output from this test protocol will be an observation log performed and witnessed by the appropriate personnel from the Home Office approved test organisation.

TP4 - In-Vehicle Device in Isolation

This test protocol verifies the DVDMS system requirements through test. The test will take the form of a bench test, of the DVDMS In-Vehicle Device in isolation. A top level block diagram of the test protocol and possible test interfaces is shown in Figure 3.

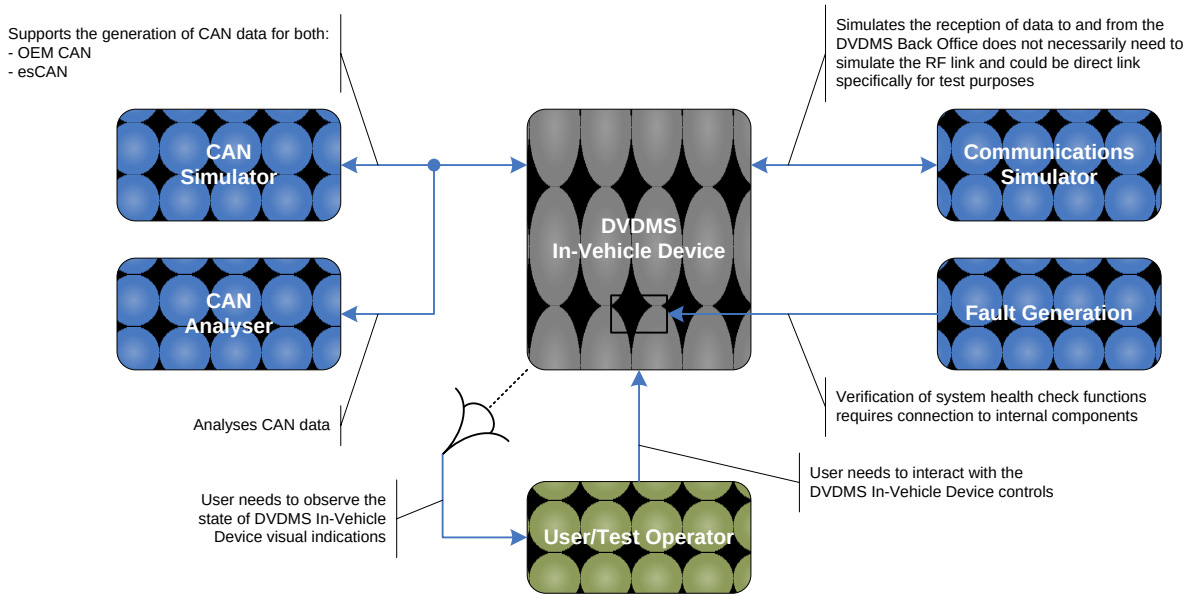

Figure 3: Bench testing of DVDMS In-Vehicle Device in isolation

The following paragraphs define the function of each block in Figure 3, which may be required to test the DVDMS In-Vehicle Device in isolation.

Controller Area Network (CAN) Simulator – simulates the vehicle CAN data generated by equipment present within the vehicle. The simulator needs to support the generation of both OEM CAN and esCAN data test parameters. As vehicle fitments vary the CAN simulator should be capable of simulating multiple CAN data test parameter patterns (including fault insertion) to cover all vehicle fitments that user organisation expects them to be fitted to. The output from the CAN simulator also needs to meet the functional and physical interface requirements of the Single Vehicle Architecture Criteria [Ref 2].

CAN Analyser – monitors and analyses the CAN data. Its primary functions are to record and verify the data being generated by the CAN simulator is correct, verify data recorded from the CAN simulator matches the data recorded by the DVDMS In-Vehicle Device and that any CAN data responses from the DVDMS In-Vehicle Devices are recorded and comply with the requirements. The CAN analyser test function should also verify any ICD requirements imposed on the DVDMS In-Vehicle

Device. The CAN analyser, although shown to be separate, could equally form part of the CAN Simulator.

Communication Simulator – simulates the reception and transmission of data from the DVDMS Back Office. note, for this test protocol this does not necessarily need to test all communication methods and as such does not necessarily need to be a simulation of an RF link. Although to some extent this will be dependant on the DVDMS In-Vehicle Device under test. The communications simulator should be capable of logging and verifying all data received from the DVDMS In-Vehicle Device, transmitting all types of DVDMS Back Office data to the DVDMS In-Vehicle Device and support data fault insertion.

Fault Generation – simulates internal DVDMS In-Vehicle Device faults to verify system heath check requirements. This test function will require internal access or access via an external connector to specific component signals to ensure the fault can be induced and correct DVDMS In-Vehicle Device operation observed.

User/Test Operator – interacts with any controls and observes any visual indications on the DVDMS In-Vehicle Device to verify compliance with the system requirements. It is also anticipated the user/test operator will have to interact with the test functions which at best would be to initiate an automated test sequence and at worst would be to manually configure and control the test functions for each test.

The output from this test protocol will be a test report(s) detailing test specification applied, test procedure used, resultant outcome and whether the outcome satisfies the pass/fail criteria. The test should be performed and witnessed by the appropriate personnel from the Home Office approved test organisation.

TP5 - Back Office in Isolation

This test protocol verifies the system requirements through test, with the DVDMS system requirements the test will take the form of a bench test, testing the DVDMS Back Office in isolation. For software only DVDMS Back Office implementations representative hardware will be required to enable testing. A top level block diagram of the test protocol and possible test interfaces is given in Figure 4.

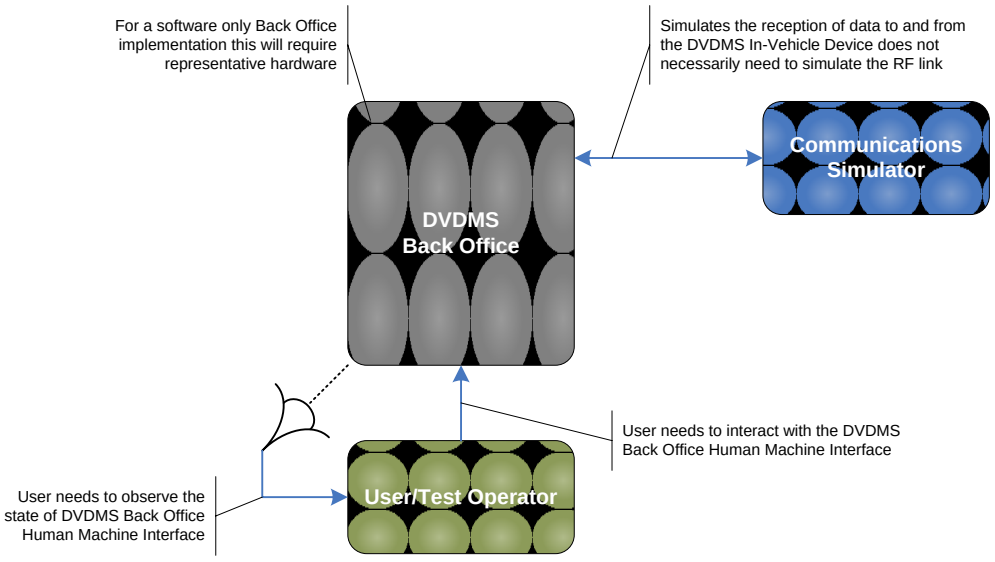

Figure 4: Bench testing of a DVDMS Back Office in isolation

The following paragraphs define the function of each block in Figure 4, which are required to test the DVDMS Back Office in isolation.

Communication Simulator – simulates the reception and transmission of data from the DVDMS In-Vehicle Device, again for this test protocol this does not necessarily need to test all communication methods and as such does not necessarily need to be a simulation of an RF link. The communications simulator should be capable of logging and verifying all data received from the DVDMS Back Office, transmitting all types of DVDMS In-Vehicle Device data to the DVDMS Back Office and support data fault insertion. It should be capable of transmitting realistic data traffic patterns to the DVDMS Back Office simulating one to many DVDMS In-Vehicle Devices.

User/Test Operator – interacts with and observes the DVDMS Back Office HMI to verify system requirements. This test protocol will primarily be used to verify compliance with the report and data searching system requirements. It is also anticipated the user/test operator will have to interact with the communication simulator which at best would be to initiate an automated test sequence and at worst would be to manually configure and control the test functions for each test.

The output from this test protocol will be a test report(s) detailing test specification applied, test procedure used, resultant outcome and whether the outcome satisfies the pass/fail criteria. The test should be performed and witnessed by the appropriate personnel from the Home Office approved test organisation.

TP6 - DVDMS System in Isolation

This test protocol verifies the DVDMS system requirements through test. The test will take the form of a bench test, testing the DVDMS as a system comprising of one DVDMS Back Office and one DVDMS In-Vehicle Device. This test protocol will allow the verification of many of the functional requirements that need to exercise the RF communications link between the DVDMS Back Office and In-Vehicle Device. This test protocol should be in a fixed location that provides a controllable and repeatable test environment. A top level block diagram of the test protocol and possible test interfaces is given in Figure 5 and the following paragraphs define the functions of each block.

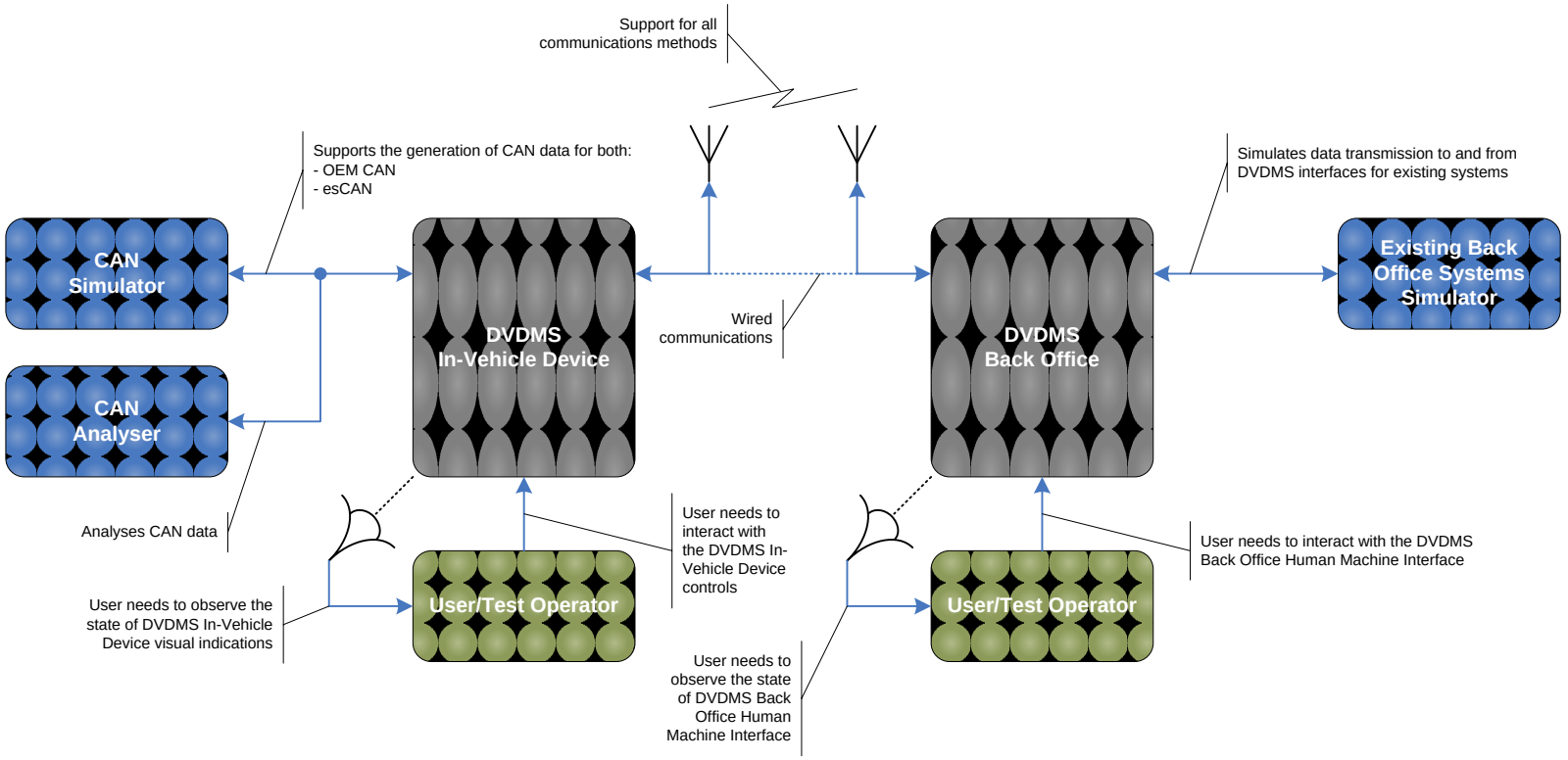

Figure 5: Bench testing of a DVDMS System in Isolation

CAN Simulator – simulates the vehicle CAN data generated by equipment present within the vehicle. The simulator needs to support the generation of both OEM CAN and esCAN data test parameters. For this test protocol the CAN data test patterns need to stimulate the DVDMS In-Vehicle Device into sending at least one of each message type and priority defined in the system requirements to the DVDMS Back Office. The output from the CAN simulator also needs to meet the functional and physical interface requirements of the Single Vehicle Architecture Criteria [Ref 2].

CAN Analyser – monitors and analyses the CAN data. Its primary functions are to record and verify the data being generated by the CAN simulator is correct, verify data recorded from the CAN simulator matches the data recorded by the DVDMS In-Vehicle Device and that any CAN data responses from the DVDMS In-Vehicle Devices are recorded and comply with the requirements. The CAN analyser although shown to be separate could equally form part of the CAN Simulator.

Communications Link – provides the communications between the DVDMS Back Office and In-Vehicle Device. This should provide support for all supported communications bearers allow the functional system requirements to be verified.

Existing Back Office System Simulator – represents the existing system the back office may connect to. This test function should not be over complex as the test protocol is only designed to verify that the functions between the DVDMS and the existing equipment work, rather than whether they are compatible with a particular existing system e.g. up to the generation of a message for communication to a user, not the actual emailing of the message, although this will be dependant on the DVDMS submitted. It is anticipated this test function will be commercial-off-the-shelf IT equipment and software such as network switches, internet gateways, laptops, mobile phones, web browser and email clients.

User/Test Operator – interacts with and observes the DVDMS. It is likely this test protocol will require more than User/Test Operator as it may prove difficult to interact and observe both sub-system simultaneously, although this will be dependant on the submitted DVDMS. For this test protocol it is anticipated the User/Test Operator for the DVDMS Back Office will be using the Back Office as intended in its' operational environment.

The output from this test protocol will be a test report(s) detailing test specification applied, test procedure used, resultant outcome and whether the outcome satisfies the pass/fail criteria. The test should be performed and witnessed by the appropriate personnel from the Home Office approved test organisation.

TP7 - EMC and Environmental Testing

This test protocol verifies the DVDMS system requirements through test. The test will take the form of a bench test performed at a suitably accredited test house, testing the DVDMS In-Vehicle Device in isolation against the Electromagnetic Compatibility (EMC) and Environmental (ENV) system requirements. A top level block diagram of the test protocol and test interfaces is shown in Figure 5.

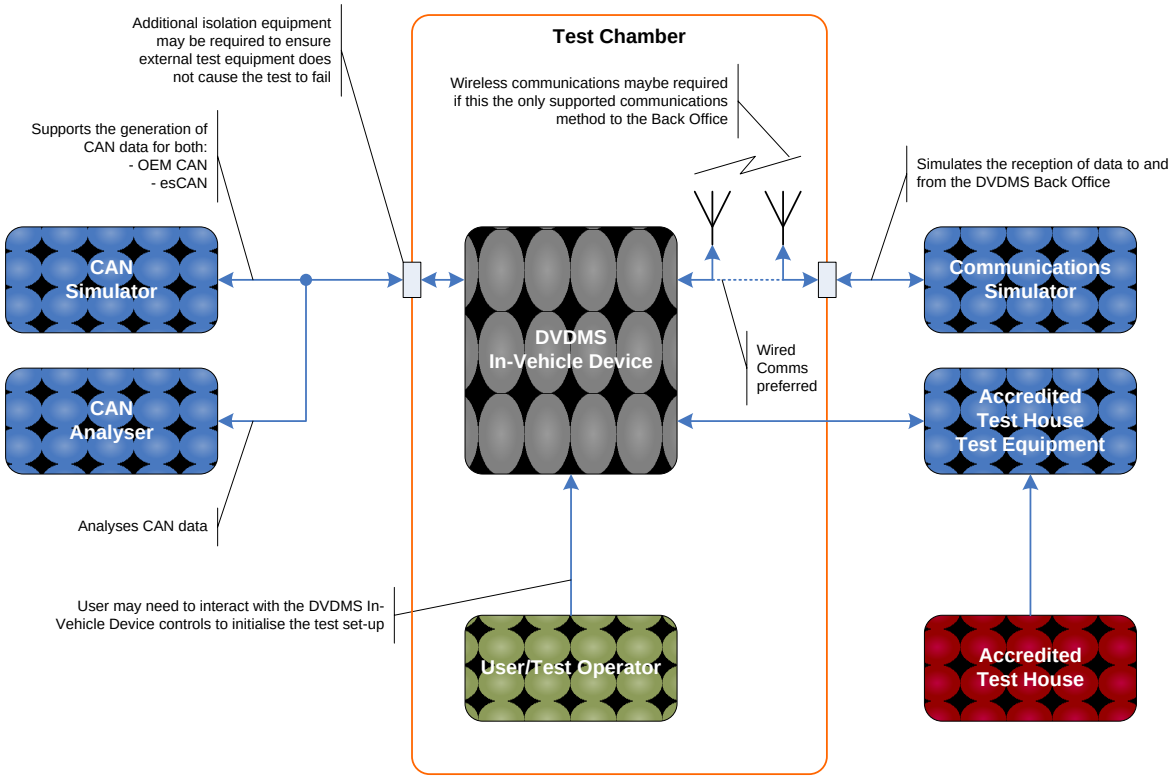

Figure 6: EMC and ENV testing of the DVDMS In-Vehicle Device

The following paragraphs define the function of each block in Figure 5, which are required to test the DVDMS In-Vehicle Device against the EMC and ENV system requirements.

Controller Area Network (CAN) Simulator – simulates the vehicle CAN data generated by equipment present within the vehicle, but different from 'TP4 - In-Vehicle Device In Isolation' in that the output is only being used to simulate representative data to exercise the equipment in manner that would be expected within its operational environment. The simulator needs be capable of automatically producing a representative CAN data parameter pattern that meets the functional and physical interface requirements of the Single Vehicle Architecture Criteria [Ref 2].

CAN Analyser – monitors and analyses the CAN data. Its primary functions are to record and verify the data being generated by the CAN simulator is correct, verify data recorded from the CAN simulator matches the data recorded by the DVDMS In-Vehicle Device and that any CAN data responses from the DVDMS In-Vehicle Devices are recorded and comply with the requirements. The CAN analyser, although shown to be separate, could equally form part of the CAN Simulator.

Communication Simulator – simulates the reception and transmission of data from the DVDMS Back Office. The simulator needs be capable of automatically producing

a representative communications data pattern to stimulate the DVDMS In-Vehicle Device in the manner it would be expected within its operational environment, ideally the DVDMS should support a wired communication link to the back office for this test protocol, however if not, this will involve simulation of the wireless communications.

User/Test Operator – interacts with controls on the DVDMS In-Vehicle Device to initialise the test set-up. It is also likely the user/ test operator will have to interact with the test functions to initiate an automated test sequence.

Accredited Test House – performs the EMC and ENV testing to the specification defined in the system requirements. The Accredited Test House is also required to meet any system requirements relating to accreditation to specific standards.

Accredited Test House Equipment – represents specific equipment held by the Accredited Test House to enable testing to the defined standards. This equipment maybe standard test equipment such as spectrum analyser, but may also represent specialised test equipment such as a vibration table.

Test Chamber – represents a boundary provided by the Accredited Test House to enable testing to the defined standard. This boundary represents an anechoic chamber for EMC testing and a temperature chamber for climatic tests, but could also represent the boundary for any specific environmental test equipment. Connections that go through the test chamber boundary may be further limited by the physical and electrical requirements of EMC and ENV test equipment. Furthermore it is important to realise that to ensure the tests do not fail because of the test function equipment, isolation equipment may be required at the chamber boundaries.

The output from this test protocol will be a test report(s) detailing test specification applied, test procedure used, resultant outcome and whether the outcome satisfies the pass/fail criteria. The test should be performed and witnessed by the appropriate personnel from the Accredited Test House.

TP8 - Integration with Existing Vehicle Systems

This test protocol verifies the DVDMS system requirements through test. The test will take the form of a vehicle test, testing the DVDMS In-Vehicle Device connected to existing vehicle systems, the in-vehicle device may or may not be fully installed for this protocol. A top level block diagram of the test protocol and possible test interfaces is shown in Figure 7.

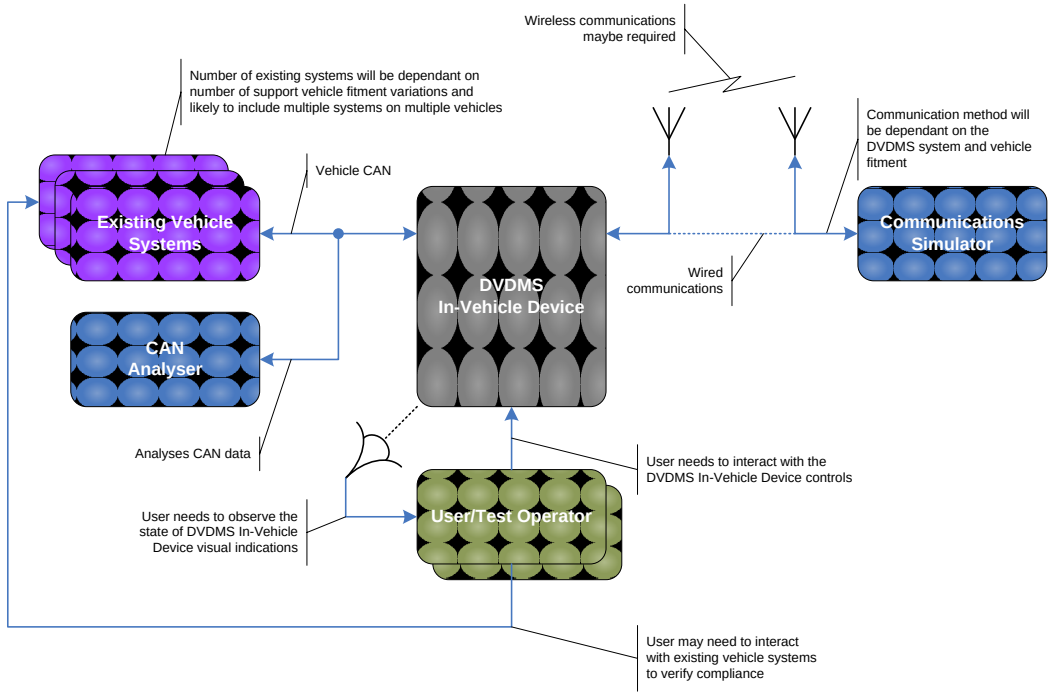

Figure 7: Testing of DVDMS In-Vehicle Device with existing vehicle systems

The purpose is to verify system requirements that cannot be verified on the DVDMS In-Vehicle Device in isolation because of the need to interact with real existing systems and testing with a fully operational test set-up is either not needed or is prohibited through cost and availability. It is likely existing systems will require stimulating manually or though driving the vehicle in normal or emergency conditions while verification of DVDMS functions and performance is verified. The following paragraphs define the function of each block shown in Figure 7.

Existing Vehicle Systems – provides real in car stimulus and although expected to be CAN, could take other forms depending on any other direct connections provided by the DVDMS In-Vehicles Device under test.

CAN Analyser – monitors and analyses the CAN data. Its primary functions are to record and verify the data being generated by the CAN simulator is correct, verify data recorded from the CAN simulator matches the data recorded by the DVDMS In-Vehicle Device and that any CAN data responses from the DVDMS In-Vehicle Devices are recorded and comply with the requirements.

Communication Simulator – simulates the reception and transmission of data from the DVDMS Back Office, note for this test protocol this does not necessarily need to test all communication methods and as such does not necessarily need to be a simulation of an RF link unless the vehicle fitment connects to an external RF device. The communications simulator should be capable of logging and verifying all data received from the DVDMS In-Vehicle Device, transmitting all types of DVDMS Back Office data to the DVDMS In-Vehicle Device and support data fault insertion.

User/ Test Operator – interacts with and observes the DVDMS In-Vehicle Device and potentially other existing vehicle systems. This test protocol may require more than one user to initialise the test set-up. It is also likely the user/ test operator will have to interact with the test functions

The output from this test protocol will be a test report(s) detailing test specification applied, test procedure used, resultant outcome and whether the outcome satisfies the pass/fail criteria. The test should be performed and witnessed by the appropriate personnel from the Home Office approved test organisation.

TP9 - Integration with Existing Back Office Systems

This test protocol verifies the DVDMS system requirements through test. The test will take the form of a back office test, testing the DVDMS Back Office connected to existing back office systems. For software only Back Office solutions this will require the installation of the DVDMS Back Office on the existing systems. For a combined software/hardware Back Office solution this may or may not be fully installed in the operational environment for this protocol. A top level block diagram of the test protocol and possible test interfaces is shown in Figure 8.

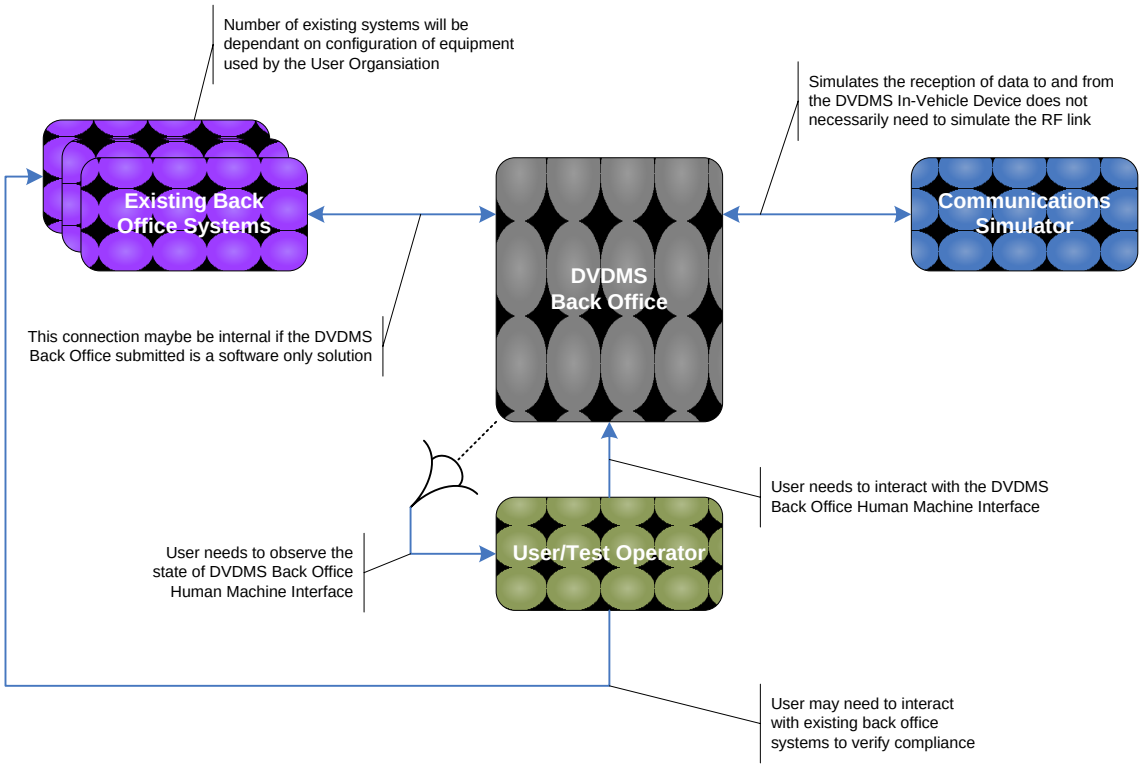

Figure 8: Testing of DVDMS Back Office with existing back office systems

Existing Back Office Systems – provides real existing back office system connections, allowing back office communication system requirements with nominated users and supervisor to be verified.

Communication Simulator – simulates the reception and transmission of data from the DVDMS In-Vehicle Device, this test protocol does not necessarily need to test all communication methods and as such does not necessarily need to be a simulation of an RF link. The communications simulator should be capable of logging and verifying all data received from the DVDMS Back Office, transmitting all types of DVDMS In-Vehicle Device data to the DVDMS Back Office and support data fault insertion. It should be capable of transmitting realistic data traffic patterns to the DVDMS Back Office simulating one to many DVDMS In-Vehicle Devices.

User/ Test Operator – interacts with and observes the DVDMS Back Office HMI to verify system requirements that need to utilise existing back office equipment to realise the intended function. The user/test operator may also need to interact with those existing systems to complete verification. It is also anticipated the user/test operator will have to interact with the communication simulator which at best would

be to initiate an automated test sequence and at worst would be to manually configure and control the test functions for each test.

TP10 - Operational Testing of System

This test protocol verifies the DVDMS system requirements through test. The test will take the form of an operational system test and as such will require the DVDMS to be installed within one or many vehicles and a suitable back office environment. This test protocol is focusing on the requirements that cannot be verified in any other way than to use the system within an operational context. A top level block diagram of the test protocol and possible test interfaces is shown in Figure 9.

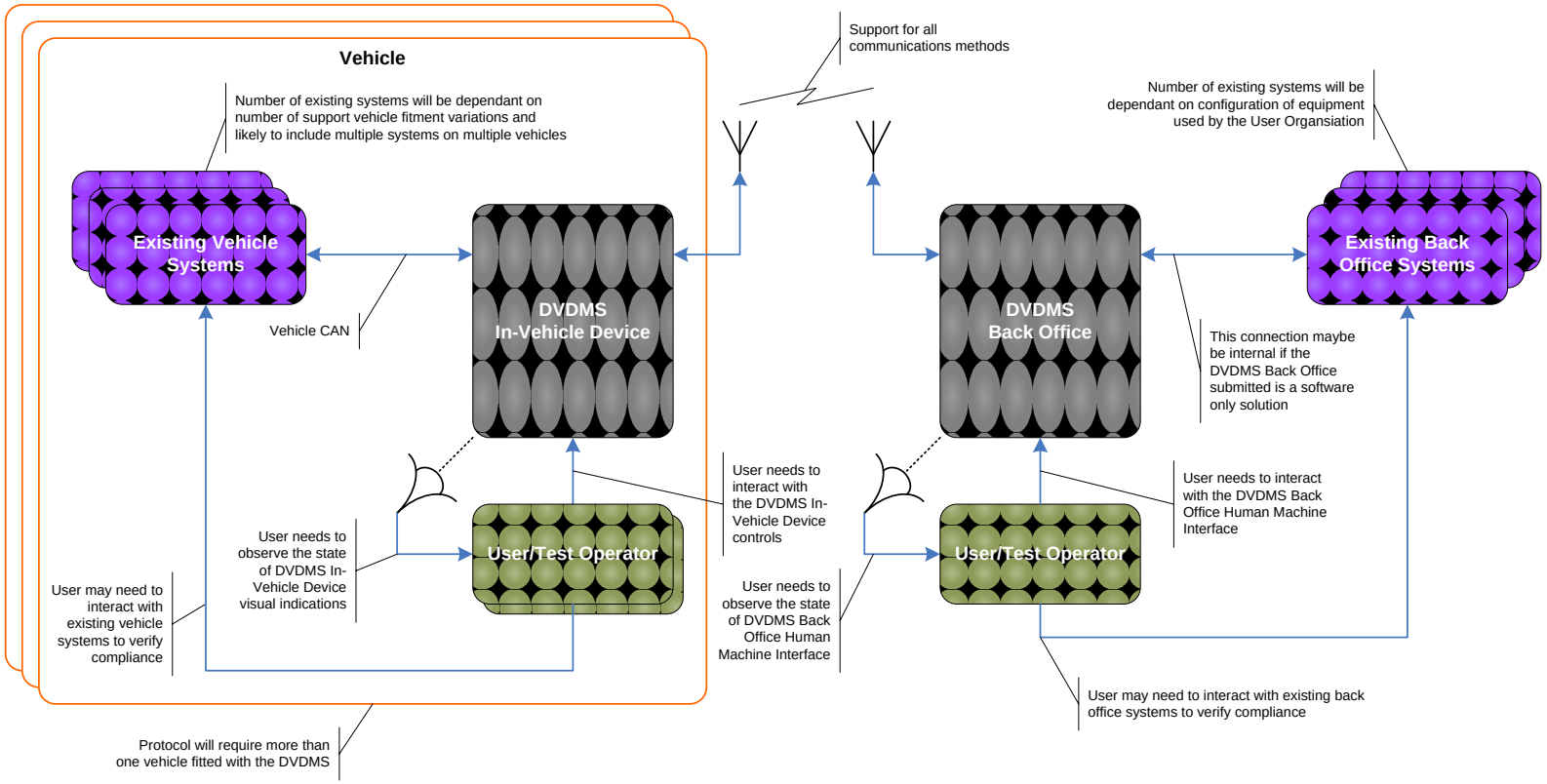

Figure 9: Operational testing of the DVDMS systems

This test protocol should be capable of verifying any of the system requirements, but is only used for a subset due to cost and practicality issues. It is envisage this test protocol will be used after the system has been purchased and installed as it is dependant on the operational environment. A key factor in this large scale test protocol will be the test procedures to ensure repeatability.

Existing Vehicle Systems – provides real in car stimulus and although expected to be CAN, could take other forms depending on the DVDMS In-Vehicles Device under test. This protocol will require one to many vehicle installations.

Existing Back Office Systems – provides real existing back office system connections, allowing back office communication system requirements with nominated users and supervisor to be verified.

User/ Test Operator – interacts with and observes both the DVDMS In-Vehicle device and Back Office. Multiple user/test operators will be required for each vehicle installation with a central user/test operator managing the Back Office and associated existing systems.

The output from this test protocol will be a test report(s) detailing test specification applied, test procedure used, resultant outcome and whether the outcome satisfies the pass/fail criteria. The test should be performed and witnessed by the appropriate personnel from the Home Office approved test organisation.

APPENDIX 1 – Test Protocol/System Requirement Cross Reference

The following tables provide a cross reference between the test protocols defined in this document and the requirements as defined in [Ref 1] they satisfy.

TP1 - Inspection (25 requirements)			
DVDMS_**R**_0045	DVDMS_R_0134	DVDMS_R_0211	DVDMS_R_0447
DVDMS_R_0061	DVDMS_R_0135	DVDMS_R_0212	DVDMS_R_0501
DVDMS_R_1282	DVDMS_R_0150	DVDMS_R_0235	DVDMS_R_1290
DVDMS_R_0062	DVDMS_R_0207	DVDMS_R_0240	DVDMS_R_1291
DVDMS_R_0109	DVDMS_R_0208	DVDMS_R_0252	
DVDMS_R_0132	DVDMS_R_0209	DVDMS_R_0284	
DVDMS_R_0133	DVDMS_R_0210	DVDMS_R_0285	

TP2 - Analysis (66 requirements)			
DVDMS_R_0030	DVDMS_R_0088	DVDMS_R_0445	DVDMS_R_0649
DVDMS_R_0032	DVDMS_R_0089	DVDMS_R_0446	DVDMS_R_0651
DVDMS_R_0034	DVDMS_R_0096	DVDMS_R_0448	DVDMS_R_0652
DVDMS_R_0035	DVDMS_R_0250	DVDMS_R_0487	DVDMS_R_0655
DVDMS_R_0037	DVDMS_R_0253	DVDMS_R_0489	DVDMS_R_0671
DVDMS_R_0039	DVDMS_R_0269	DVDMS_R_0494	DVDMS_R_0678
DVDMS_R_0042	DVDMS_R_0281	DVDMS_R_0495	DVDMS_R_0680

DVDMS_R_0046	DVDMS_R_0283	DVDMS_R_0526	DVDMS_R_0686
DVDMS_R_0058	DVDMS_R_0290	DVDMS_R_0528	DVDMS_R_0687
DVDMS_R_0060	DVDMS_R_0326	DVDMS_R_0533	DVDMS_R_0689
DVDMS_R_1244	DVDMS_R_0334	DVDMS_R_0549	DVDMS_R_0729
DVDMS_R_0063	DVDMS_R_0345	DVDMS_R_0550	DVDMS_R_1272
DVDMS_R_1289	DVDMS_R_0378	DVDMS_R_0587	DVDMS_R_0756
DVDMS_R_0072	DVDMS_R_0399	DVDMS_R_0588	DVDMS_R_1284
DVDMS_R_0083	DVDMS_R_0407	DVDMS_R_0623	DVDMS_R_1285
DVDMS_R_0084	DVDMS_R_0429	DVDMS_R_0642	
DVDMS_R_0087	DVDMS_R_0436	DVDMS_R_0645	

TP3 - Demonstration (14 requirements)			
DVDMS_R_0091	DVDMS_R_0289	DVDMS_R_0470	DVDMS_R_1271
DVDMS_R_0092	DVDMS_R_0441	DVDMS_R_0500	DVDMS_R_0757
DVDMS_R_0287	DVDMS_R_0442	DVDMS_R_0534	
DVDMS_R_0288	DVDMS_R_0455	DVDMS_R_0679	

TP4 - In-Vehicle Device in Isolation (72 requirements)			
DVDMS_R_0047	DVDMS_R_0128	DVDMS_R_0322	DVDMS_R_0385
DVDMS_R_0048	DVDMS_R_0129	DVDMS_R_0323	DVDMS_R_0390
DVDMS_R_0049	DVDMS_R_0144	DVDMS_R_0324	DVDMS_R_0394
DVDMS_R_0050	DVDMS_R_0169	DVDMS_R_0325	DVDMS_R_0396
DVDMS_R_0051	DVDMS_R_1286	DVDMS_R_0340	DVDMS_R_0397
DVDMS_R_0052	DVDMS_R_0174	DVDMS_R_0343	DVDMS_R_0398
DVDMS_R_0053	DVDMS_R_0176	DVDMS_R_0347	DVDMS_R_0402
DVDMS_R_0055	DVDMS_R_0180	DVDMS_R_0349	DVDMS_R_0404
DVDMS_R_0086	DVDMS_R_0194	DVDMS_R_0350	DVDMS_R_0406
DVDMS_R_0094	DVDMS_R_1287	DVDMS_R_0351	DVDMS_R_0408
DVDMS_R_0095	DVDMS_R_0273	DVDMS_R_0358	DVDMS_R_0426
DVDMS_R_0097	DVDMS_R_0275	DVDMS_R_0359	DVDMS_R_0568
DVDMS_R_0098	DVDMS_R_0278	DVDMS_R_0361	DVDMS_R_0569
DVDMS_R_1247	DVDMS_R_0311	DVDMS_R_0362	DVDMS_R_0571

DVDMS_R_0115	DVDMS_R_0312	DVDMS_R_0366	DVDMS_R_0572
DVDMS_R_0122	DVDMS_R_0314	DVDMS_R_0368	DVDMS_R_0615
DVDMS_R_0126	DVDMS_R_0319	DVDMS_R_1279	DVDMS_R_1079
DVDMS_R_0127	DVDMS_R_0320	DVDMS_R_0377	DVDMS_R_0329

TP5 - Back Office in Isolation (47 requirements)			
DVDMS_R_0304	DVDMS_R_0513	DVDMS_R_1280	DVDMS_R_0633
DVDMS_R_0306	DVDMS_R_0514	DVDMS_R_0617	DVDMS_R_0637
DVDMS_R_0307	DVDMS_R_0515	DVDMS_R_0618	DVDMS_R_0638
DVDMS_R_0309	DVDMS_R_0517	DVDMS_R_0620	DVDMS_R_0639
DVDMS_R_0353	DVDMS_R_0520	DVDMS_R_0621	DVDMS_R_0644
DVDMS_R_0477	DVDMS_R_0529	DVDMS_R_0624	DVDMS_R_1269
DVDMS_R_0479	DVDMS_R_0532	DVDMS_R_0625	DVDMS_R_1270
DVDMS_R_0502	DVDMS_R_0554	DVDMS_R_0626	DVDMS_R_0675
DVDMS_R_0509	DVDMS_R_0555	DVDMS_R_0627	DVDMS_R_0734
DVDMS_R_0510	DVDMS_R_0558	DVDMS_R_0628	DVDMS_R_0739
DVDMS_R_0511	DVDMS_R_0562	DVDMS_R_0630	DVDMS_R_0755
DVDMS_R_0512	DVDMS_R_0610	DVDMS_R_0631	

TP6 - DVDMS System in Isolation (70 requirements)			
DVDMS_R_0205	DVDMS_R_0357	DVDMS_R_0422	DVDMS_R_0570
DVDMS_R_0261	DVDMS_R_0360	DVDMS_R_0423	DVDMS_R_0573
DVDMS_R_0262	DVDMS_R_0365	DVDMS_R_0424	DVDMS_R_0574
DVDMS_R_0263	DVDMS_R_0370	DVDMS_R_0430	DVDMS_R_0576
DVDMS_R_0266	DVDMS_R_0371	DVDMS_R_0434	DVDMS_R_0592
DVDMS_R_0276	DVDMS_R_0381	DVDMS_R_0435	DVDMS_R_0593
DVDMS_R_0277	DVDMS_R_0384	DVDMS_R_0438	DVDMS_R_1274

DVDMS_R_0291	DVDMS_R_0387	DVDMS_R_0439	DVDMS_R_0595
DVDMS_R_0298	DVDMS_R_0388	DVDMS_R_0443	DVDMS_R_0596
DVDMS_R_0299	DVDMS_R_0391	DVDMS_R_0444	DVDMS_R_0597
DVDMS_R_0300	DVDMS_R_0392	DVDMS_R_0449	DVDMS_R_0598
DVDMS_R_0313	DVDMS_R_1267	DVDMS_R_0450	DVDMS_R_0599
DVDMS_R_0315	DVDMS_R_0401	DVDMS_R_0451	DVDMS_R_0600
DVDMS_R_0316	DVDMS_R_0403	DVDMS_R_0452	DVDMS_R_0601
DVDMS_R_0317	DVDMS_R_0412	DVDMS_R_0453	DVDMS_R_0605
DVDMS_R_0342	DVDMS_R_0413	DVDMS_R_0454	DVDMS_R_0607
DVDMS_R_1266	DVDMS_R_0415	DVDMS_R_0457	
DVDMS_R_0354	DVDMS_R_0419	DVDMS_R_0548	

TP7 - EMC and Environmental Testing (11 requirements)			
DVDMS_R_0152	DVDMS_R_0155	DVDMS_R_0157	DVDMS_R_0160
DVDMS_R_0153	DVDMS_R_1248	DVDMS_R_0158	DVDMS_R_0162
DVDMS_R_0154	DVDMS_R_0156	DVDMS_R_1249	

TP8 - Integration with Existing Vehicle Systems (6 requirements)			
DVDMS_R_0119	DVDMS_R_0265	DVDMS_R_0504	DVDMS_R_0505
DVDMS_R_0120	DVDMS_R_0296		

TP9 - Integration with Existing Back Office Systems (12 requirements)			
DVDMS_R_0382	DVDMS_R_0483	DVDMS_R_0657	DVDMS_R_0660

DVDMS_R_0478	DVDMS_R_0484	DVDMS_R_0658	DVDMS_R_0661
DVDMS_R_0482	DVDMS_R_0643	DVDMS_R_0659	DVDMS_R_0662

TP10 - Operational Testing of System (26 requirements)			
DVDMS_R_0204	DVDMS_R_0538	DVDMS_R_0545	DVDMS_R_0582
DVDMS_R_0267	DVDMS_R_0539	DVDMS_R_0567	DVDMS_R_0586
DVDMS_R_0417	DVDMS_R_0540	DVDMS_R_0575	DVDMS_R_0589
DVDMS_R_0418	DVDMS_R_0541	DVDMS_R_0578	DVDMS_R_0634
DVDMS_R_0503	DVDMS_R_0542	DVDMS_R_0579	DVDMS_R_0636
DVDMS_R_0536	DVDMS_R_0543	DVDMS_R_0580	
DVDMS_R_0537	DVDMS_R_0544	DVDMS_R_0581	

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