

Railway Certification

ERTMS test solutions and services



Industrial Services

- **R&D in ERTMS software and hardware test solutions**
 - + Component testing
 - + Maintenance solutions
 - + Train/Track Validation
 - + Tools development
- **Available tools**
 - + DEM (DMI Event Manager)
 - + SA-TAV (Semi-automatic Trip and Analysis Validation)
 - + LIT (Log Importation Tool)



MULTITEL, Your **R&D and Innovation** Partner

- Electronics and Embedded Systems | Speech-Centric Human-Machine Interfaces | Network Engineering | Applied Photonics | Traceability | Image Processing | **Railway Certification**
- Development and implementation of innovative technology solutions
- Technology Transfer
- Strong participation in European research programmes

Railway Certification

ERTMS test solutions and services



Industrial Services

The Certification department of Multitel is specialized in testing solutions, as a support for the certification and validation of industrial solutions and components and on validation of ERTMS deployments for infrastructure managers, in particular for the railway signaling sector (ERTMS).

R&D IN ERTMS SOFTWARE AND HARDWARE TEST SOLUTIONS

- **Component testing:** Subset-076 (EVC – onboard train computer), Subset-085 (Balise and BTM testing) and Subset-074 (STM) testing can be ordered to the laboratory of the Certification Department: MultiRailLab.
- **Maintenance solutions:** Examples of developed maintenance solutions that the Certification Department can provide are: balise quality of signal analysis tool and hardware, services and testing facilities for the migration of train track side infrastructure to newer standards.
- **Train/Track Validation:** MultiRailLab can provide in laboratory early detection of train/track validation problems. Actually, we can provide full validation of new lines as well of new trains on old tracks, from project data, gradients, operational and engineering rules, balise and radio telegrams (possibly taken from JRU data, in case of existing infrastructure). Then, at MultiRail Lab we match the existing SRS requirements with the existing infrastructure and we exercise in laboratory tests to reproduce most of the expected train track functionalities.

Detailed reporting: Our reportings provide the reason of the failure and points out the observed values side-by-side with the expected values at the variable level. In case of multilayer protocols like the Euroradio protocol, our reports can show the communication layer per layer, with the protocol detailed in a human readable format up to the variable level.

Our approach:

Adaptation modules: Build generic tools and handle the specific cases through adaptation modules. This allows fast development of new testing facilities, assuring cost effective upgrade of test equipment and protection of client proprietary interfaces.

Some key projects :

- TEN 2006 (2006/2010): Development of SRS 2.3.0D, test cases, test sequences and test campaigns for industrial equipments (Invensys, Ansaldo). Financing agency : European Commission TEN-T agency.
- Baseline 3 Backward Compatibility (2010): Evaluation of the compatibility of onboard units implementing SRS 3.0.0 in SRS 2.3.0D infrastructures. Financing agency EEIG Users Group.
- ERA Tender (2009/2012): Development of SRS 3.0.0, test cases and test sequences. Financing agency ERA (European Railway Agency).
- Industrial Tests: Hitachi onboard units (EVC), Invensys, Ansaldo STS...
- Railway Operators: INFRABEL (DMI recording and event recognition)...

DEM (DMI EVENT MANAGER)

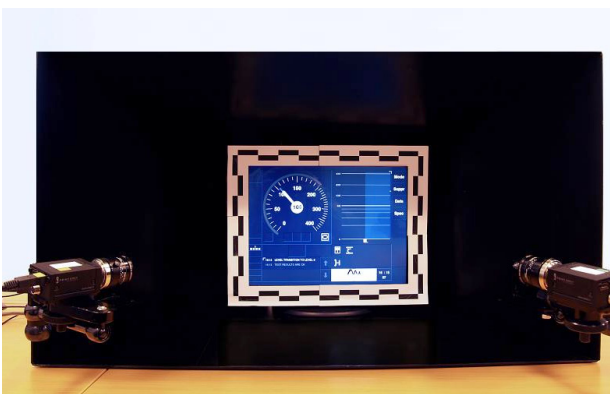
DEM (DMI Event Manager): The aim of this tool is to record and identify the events (icons, text, gauges) in the DMI (Driver Machine Interface) from the video images of the taken by the tool itself.

This tool combines 3 different steps, namely :

- The digital stabilisation and homographic transformation of the original image, therefore recovering the full DMI image, even in case of vibrations and in case the camera is not right in front of the DMI screen by for example by its side.
- Stereo recording for removing the hands of the driver/robot arm that operates the DMI. In this step a complete DMI image is reconstructed and the detection of the point of contact between the driver and the DMI screen is detected. Both informations will be useful for the validation of onboard train computers (EVCs).
- Event recognition is performed for icons (ERTMS level, OS, FS...), text messages and gauges among others. These events are then stored in a database for easy manipulation.

Flexibility : The tool is specialised for the recognition of DMI images, but it can be easily generalised to the detection of other screen images and its respective recognition. The time necessary to adapt the tool to another screen definition is of just a couple of days.

Currently the main use of DEM is to speed up the annotation of the video images and in particular of DMI image necessary to validate the operation of train onboard computers such as the EVC (European Vital Computer) on high speed trains. Other uses may be the validation of DMI interface, ergonomics testing...



The DEM developed by Multitel can remove the hands of the driver, recover the full DMI image to identify and record events automatically for faster black box ETCS testing.

SA-TAV (SEMI AUTOMATIC TRIP AND ANALYSIS VALIDATOR)

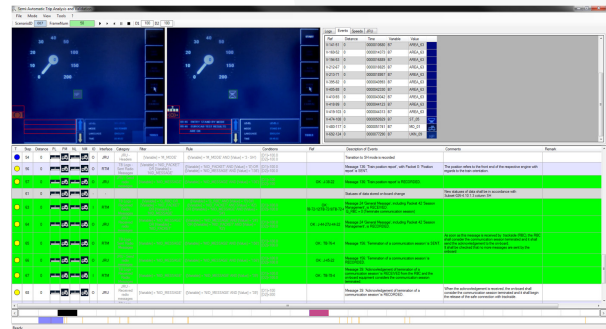
SA-TAV (Semi Automatic Trip and Analysis Validator): The aim of this tool is to process all the information exchanged by the EVC and perform a validation of its behaviour.

SA-TAV takes as input all data exchanged with the train, such as the TIU (Train Interface Unit) data, JRU (Juridical Recording Unit), GSM-R radio communication, BTM (Balise Transmission Module) data and the DMI (Driver Machine Interface) interface through the database provided by the DEM (DMI Event Manager software) database.

SA-TAV provides a way to match the behaviour of the EVC against the expected scenarios step-by-step. The match is automated by filters for each EVC interface. SA-TAV brings the information in filtered and convenient way to the ERTMS expert to validate or not its behaviour. The scenarios can be of two kinds:

- Subset-076 test sequences, for which SA-TAV comes with all necessary filters and expected values, so that the expert only needs to match the observed values against the expected ones.
- Project data from a track, for which SA-TAV can use the existing filters to reduce the amount of information that the ERTMS expert needs to evaluate to identify if the track and/or the train behaves as expected.

SA-TAV provides at the end a text report with all evidences of the matches or mismatches of the tests. These evidences include the recorded DMI image frames of the transition of an event, e.g. when an icon indicating the OS (On Sight) mode changed to FS (Full Supervision) or any other mode; These evidences also include the GSM-R communications, the BTM telegrams and the JRU stored data, all with its parameters decoded and with expected values shown side-by-side for easy comparison.



Time	Mode	Parameter	Value	Expected
14:00:00	OS	Mode	OS	OS
14:00:05	FS	Mode	FS	FS
14:00:10	FS	Mode	FS	FS
14:00:15	FS	Mode	FS	FS
14:00:20	FS	Mode	FS	FS
14:00:25	FS	Mode	FS	FS
14:00:30	FS	Mode	FS	FS
14:00:35	FS	Mode	FS	FS
14:00:40	FS	Mode	FS	FS
14:00:45	FS	Mode	FS	FS
14:00:50	FS	Mode	FS	FS
14:00:55	FS	Mode	FS	FS
14:01:00	FS	Mode	FS	FS

Automatisation of ERTMS test analysis

In summary we can say that SA-TAV is a tool that speeds up the process of validation, assures the completeness of the test and enables the ERTMS expert to focus on the relevant information up to the detail level if necessary.

LIT (LOG IMPORTATION TOOL)

LIT (Log Importation Tool): The aim of this tool is allow the connection of an existing laboratory facility to our analysis tools (DEM and SA-TAV), so that our clients can assure the quality of the results, while saving investment by reusing existing test facilities.

This is a service provided by Multitel to our clients of DEM and SA-TAV.



For additional information, please contact:
Phone: +32 65 34 27 40 or +32 65 34 27 22
or e-mail : ertms@multitel.be.

Parc Initialis / rue Pierre et Marie Curie 2 / B-7000 MONS / BELGIUM
www.multitel.be



Union européenne



Wallonie

L'Union européenne et la Wallonie investissent dans votre avenir

ERTMS ADAPTOR BOX

Multitel has developed adaptor boxes for a number of TestBench / EVC combinations. These adaptor boxes can connect directly with a number of commercial EVCs as well as RBC. Our adaptor boxes also provide compatibility with the Subset-094 interface for compatibility with other ERTMS laboratories. The main advantage is that our clients don't need to worry about implementing adaptors for their equipments. We have a number of modular interfaces, including Profibus, MVB, RS422, RS485, EuroBalise, Doppler radar, TIU and other proprietary interfaces, covering a wide range of railway industrial interfaces.



EBTM (EUROBALISE BTM) SNIFFER

At the onboard unit the only information available is the information after being processed by the BTM. If the signal coming from the Eurobalise is weak or malformed it is not possible to recover the information and to detect from where the problem comes from. With our EBTM Sniffer that fits in the BTM we can detect the raw signal sent by the Eurobalise and perform validation, check the communication protocol up to the SRS variable level and detect the quality of the signal. This way our sniffer can be used as a way to do preventive maintenance of the Eurobalises and anticipate failure, thus saving direct and indirect costs due to operating signaling failure.

