



ERSA by CLEARSY PRODUCTS AND SERVICES

ERSa

by CLEARSY

THE BENCHMARK FOR
ERTMS & ETCS

ERTMS & ETCS
PRODUCTS AND SERVICES

CONTACT.ERSA@CLEARSY.COM

ABOUT US

Based in the heart of Europe, ERSA has been in the vanguard of ERTMS test specification and system consolidation, and has been supporting customers across Europe and Asia for more than 20 years.

Dedicated to marrying technical excellence, creative thinking and world-leading delivery into a single package ERSA has used its software architecture, development and design skills to translate the complex detail of European Interoperability's ERTMS / ETCS / EVC specifications into a suite of tools which are then supplied to you – positioning you at the cutting edge of the rail industry. ERSA is fiercely proud of its reputation for designing and implementing complex technical solutions that are both easy for its customers to use, and reliable.

CLEARSY has passed a new major milestone, thanks to the acquisition on July 12, 2018, of the company ERSA. This enables us to access larger projects, by merging the known competencies of CLEARSY in safety systems with those of ERSA in main lines. Both companies are combining their expertise and skills to harmonise their solutions and offer services and products ever more innovative and safe.

CLEARSY is a company of 140 employees whose main know-how is the design and production of certified safe systems and software applications, through the use of formal methods in industrial sectors such as urban and main-line railways, in particular the B method for the design of driverless (GoA3) or unattended (GoA4) train operation systems), automotive, energy and defence.

OUR CUSTOMERS

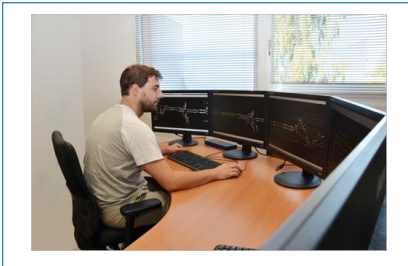
- Standards Authorities
- Consultants
- Systems Integrators
- Original Equipment Manufacturers
- Notified Bodies
- Certified Independent Testers
- Rail Infrastructure Managers
- Railway Undertakings
- Train Operating Companies
- Training Providers
- Researchers

OUR SOLUTIONS



> ERTMS/ETCS OPERATIONAL SIMULATOR

A visualisation of your train running under ERTMS/ETCS supervision which can be used for training, demonstration and testing purposes. The system can also be used in the development of operating rules and to investigate deployment issues



> ERTMS/ETCS TRAFFIC SIMULATOR

An advanced real-time system which can be used for evaluating line capacity and improvements, validating RBCs, assessing conflict detection/resolution systems, signaller training and replicating real life events



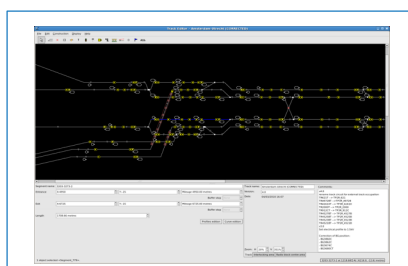
> ERTMS/ETCS OBU AND RBC TEST BENCHES

A range of advanced test benches which allow you to test your On Board Units and Radio Block Centres, individually or in a cross test combination



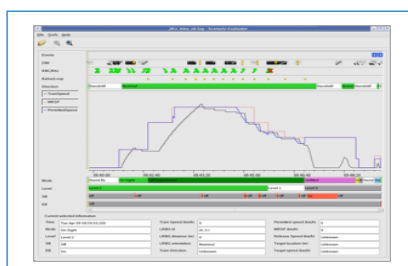
> ETCS DRIVER MACHINE INTERFACE

A production DMI providing a compliant interface to the ERTMS/ETCS system allowing driver identity and train data, to be entered, and displays of driving information, including speed, planning area, ETCS level, and mode



> TRACK EDITOR

Allowing you to create and modify track models for use with our operational and traffic simulation tools and test benches. The track models can be used in all ERTMS/ETCS application levels



> SIMULATION AND TEST EVALUATION TOOLS

Simplifying the task of analysing, displaying and reporting the data generated using our operational and traffic simulation tools, or by third party on-board systems

ERTMS/ETCS OPERATIONAL SIMULATOR

Our Operational Simulator provides you with a real-time visualisation of your train running under ERTMS/ETCS supervision.

BENEFITS

Using our Operational Simulator will allow you to:

- identify scheme options and assess them quickly and easily so that good engineering design and configuration decisions can be made at the earliest stages of your project thereby reducing the risk of, and avoiding the high cost of rework during project implementation
- develop and assess the effects of new or changed operating rules arising from regulatory changes or changes to the infrastructure before they are implemented
- visualise and demonstrate train running on the new or proposed infrastructure under current or new operating rules giving stakeholders the confidence they require
- train and assess your staff to work under ERTMS/ETCS supervision without the need to expose them to the hazards of the operational railway, and avoiding the costs of track access and trains.

THE ERTMS/ETCS OPERATIONAL SIMULATOR

The true complexity of the railway system is embedded in our ERTMS/ETCS Simulation System which can be used with a number of built-in predefined simulation scenarios, or to give you the flexibility to define and explore your own scenarios: ETCS telegrams and messages, signal aspect and point position changes required to run trains with interactive train control. We provide a set of user configurable modules:

A track and scenario editor which is used to define the train and set default data for EVC, and to set event driven messages

A train dynamic module which calculates train movements based on track voltage, gradient and adhesion and inputs from the EVC or driver inputs through the key board (or optionally) the desk or joystick

An EVC simulator interfaces to the driver, train, positional data and trackside elements of ERTMS (baseline 2 and 3). Other national train control system standards can also be implemented and interfaced with the EVC simulator

An ETCS Driver Machine Interface module; compliant with the ERA specification the DMI provides a cab display allowing the driver to see the track and to input information.

A Trackside simulator which transmits baseline 2 and 3 packets and messages (balise, loop, and radio), and national ATP/ATC data

All simulation functions are installed on a single PC which displays the ETCS Driver Machine Interface, a simplified driver's desk with cab instruments; and the EVC supervision curves.

OPTIONS

The value of our system can be further enhanced by extending it to include:

- a second PC giving the operator a realistic real-time 3D view of the track, direction of the travel, speed, weather conditions, and trackside equipment
- a joystick to control train movements, and a keyboard for operator inputs.



ERTMS/ETCS TRAFFIC SIMULATOR

Our ERTMS/ETCS Traffic Simulator is an advanced real-time system which can be used for evaluating line capacity and improvements, validating RBCs, assessing conflict detection/resolution systems, signaller training and replicating real life events.

BENEFITS

Using our Traffic Simulator will allow you to:

- build a detailed engineering model of a complete railway running under ERTMS/ETCS control
- investigate realistic timetable scenarios involving multiple trains interacting with RBC, interlocking and traffic management systems
- evaluate impact on line capacity and recovery from disruption for different track layouts, ERTMS/ETCS levels and traffic management options.

THE ERTMS/ETCS TRAFFIC SIMULATOR

The true complexity of the railway system is embedded in our Traffic Simulator which can be used with a number of generic trains, alternatively you can define your own train and use that alongside a set of user configurable modules:

Generic Train Modules which support all ERTMS/ETCS levels can be included in the simulation, and can be fully customised by the user and simulate train dynamics and baseline 2 or 3 on-board units. Train objects can be driven manually and start from any location on the track, and in automatic mode they can run according to the timetable and the driving information and data received over the balise, loop and radio interfaces.

The traffic simulation is managed by a **Scenario Controller** which initiates or stops the simulation and allows users to inject events or failures in track or train.

A **Route Map Manager** shows the track topology and all train movements, and allows users to show or hide other features; balises, track circuit status, track profiles, boards and signals.

The **Interlocking** allows users to set and lock routes; and provides block condition status required by the Radio Block Centre module to send movement authorities to the trains.

The **Radio Block Centre** (RBC) manages connection and disconnection to trains, issues movement authorities TSRs and text messages; receives position reports, sends and revokes emergency stops; and displays the new position of trains as soon as a report is received. The RBC can also generate diagrams showing actual and predicted positions of all trains in the simulation.

OPTIONS

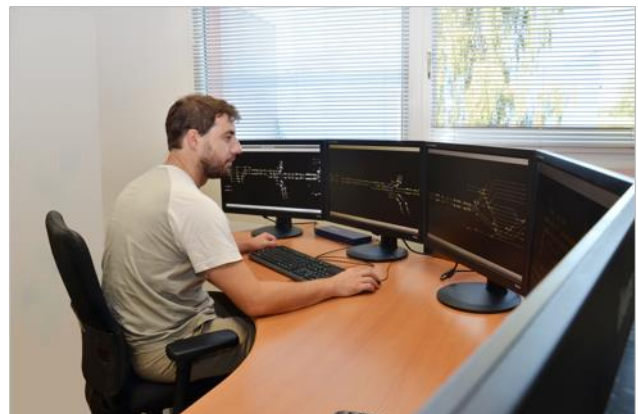
We have developed three optional modules which customers will find increase flexibility and scope of the core simulator and add value:

Automatic Route Setting is an optional module; based on a timetable and train path, ARS sets routes without the need for user input. This module can be disabled allowing users to set routes manually.

Our **OPSIMU train modules** provide users with the option to add a complete ERA ERTMS/ETCS DMI and a realistic train desk control to set up a demonstration and training environment.

Our **Traffic Evaluation Tool** will simplify the analysis of the various data collected during the simulation giving users an insight into:

- track occupation changes
- point settings and signal aspect changes
- radio connections/disconnections and radio holes
- RBC/Train and RBC/RBC messages
- positional data.



ERTMS/ETCS DRIVER MACHINE INTERFACE

Our Driver Machine Interface (DMI) software runs on customers or third party hardware for installation on train, or in our simulation tools and provides a cab display allowing the driver to input information into the ERTMS/ETCS system; it allows driver identity and train data to be entered, and displays of driving information, including speed, planning area, ETCS level, and mode. The DMI also prompts driver actions: selection of driving mode, confirmations and acknowledgements.

BENEFITS

Using our Driver Machine Interface will allow you to :

- avoid in-house development of this key component of an ERTMS/ETCS on-board system by buying in an existing proven component
- comply with ERA recommendations for standardisation of the driver interface
- easily configure the system for specific rolling stock types, optional features and languages.



SPECIFICATION

Our DMI satisfies ERA DMI specifications and supports ERA's recommendations on area design. ETCS levels 1 to 3 are all supported, as are all technical modes requiring an open driver's desk including Standby, Unfitted, Shunting, Staff Responsible, Full Supervision, On Sight, Trip, Post Trip, Reversing, Non-Leading, Limited Supervision, and National Systems.

Automatic testing and self-test functionality is built in.

In addition to the ERA specification some national system layouts are also optionally included: ATB EG, KVB/TVM, PZB, AWS/TPWS, ATC-2, and ZUB.

FLEXIBILITY

Our standard DMI runs on a 10.4" display with a 800x600 screen resolution but is highly configurable; with modular software it is available in Linux and Windows versions depending on the hardware you want to host it on, and a range of and communications protocols are available for links to the EVC.

As the ERTMS specification continues to develop, we have minimised the disruption users might see in keeping their DMI current. Configuration and flexibility are built in; many parameters can be accessed outside the application itself, allowing some parameters to be configured without modifying the software, these include: driver language, train data, icons and text, the optional colour palette. downloads or flash memory exchanges allow our DMI to be updated simply.

TRACK EDITOR

Our Track Editor tool allows you to create and modify track models for use with our operational and traffic simulation tools and test benches. The track models can be used in all ERTMS/ETCS application levels.

BENEFITS

Using our Track Editor will allow you to:

- apply your ERSa simulation tools and test benches to a wide range of projects and scenarios
- maximise the use of in-house staff to configure the systems
- minimise repeated data entry by exchanging data in formats such as RailML® or SUBSET-112.

SPECIFICATION

The Track Editor Tool presents a user-friendly interface allowing you to:

- define complex track sections quickly
- navigate around the track easily
- independently zoom horizontally and vertically
- compute distances
- rename elements automatically

The track model can include:

- topology and physical data including points, gradient and curvature
- infrastructure data including tunnels, stations, bridges, and level crossings
- Signalling information including signals, boards, marker boards, track circuits
- ERTMS/ETCS baseline 2 and 3 compliant balise and infill device data
- National signalling equipment location and characteristics

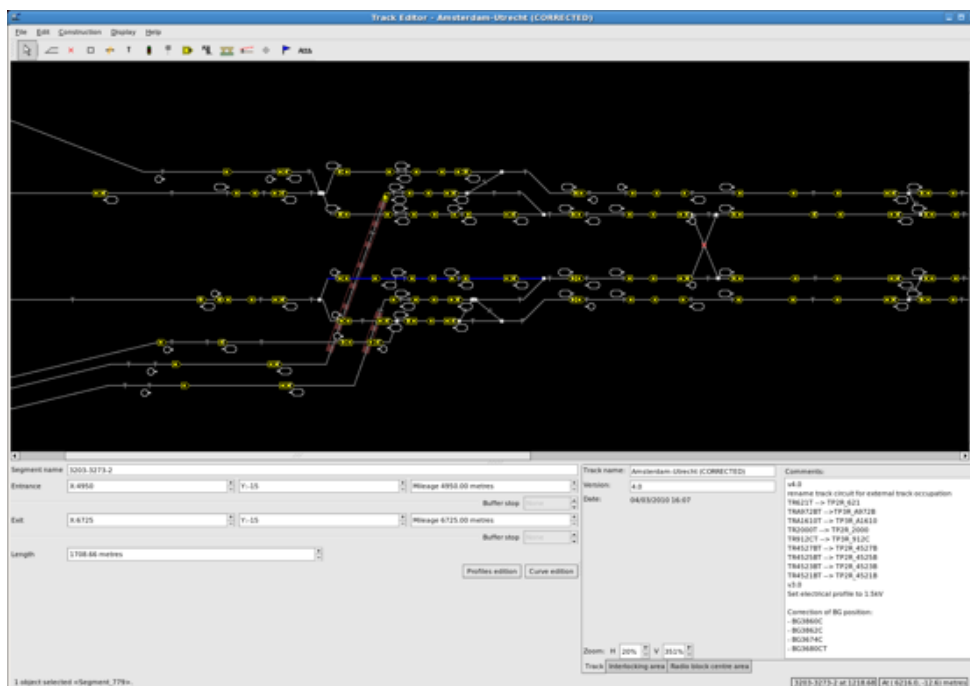
These features give you a further refinement of details aimed at identifying scheme options and assessing them quickly and easily so that good engineering design and configuration decisions can be made at the earliest stages of your project thereby reducing the risk of, and avoiding the high cost of rework during project implementation.

FLEXIBILITY

The Track Editor includes automatic track data import/ export from/to standardised formats such as RailML® or SUBSET-112. Custom import/export solutions can also be provided.

OPTIONS

Users choosing to have the 3D generation module in Track Editor will be able to turn their 2D representations into 3D environments which can be used with our (optional) 3D tool suite.



TEST BENCHES FOR ERTMS/ETCS COMPONENTS

We have gained significant experience of ERTMS/ETCS through our involvement in many EU projects, and through our development of operational, traffic simulation and training tools, and have a range of advanced test benches which allow you to test your ERTMS/ETCS components.

Our test benches are used by a range of customers including:

- OEMs
- Notified Bodies and Independent Testing Providers
- Investigators

BENEFITS

Our Test Benches provide:

- a proven route to validating your On Board Units and Radio Block Centre equipment against the ERTMS/ ETCS standards avoiding costly retesting at the product approval stage
- the tools to test and approve ERTMS/ETCS equipment independent of the OEMs, giving the Infrastructure operators and train operators the confidence they need.

TEST BENCH FOR ON BOARD SYSTEMS

ARCHITECTURE

Our OBU Test Bench is compliant with the Reference Architecture defined in SUBSET 094:

- Using our **off-line tool**, test sequences which are part of SUBSET-076, can be automatically imported and stored as scenarios. Users can also create testing information including train parameters, speed profile, messages based on baseline 2 or baseline 3.
- Our **on-line tool** is used to define and control a test environment which is connected to the on board system to be tested using standard interfaces.

TEST ENVIRONMENT

The test environment in our OBU Test Bench is made up of several modules which work together to test customers' OBUs, these include:

- a **scenario controller** to start, manage and stop scenarios
- a **driver simulator** to automatically enter data on the DMI and perform actions on the desk
- a **train motion simulator** to perform the train dynamics
- a **speed sensor simulator** to deliver the odometric information to the EVC
- a **TIU simulator** to enable and stimulate the interfaces between EVC and train
- modules to simulate the transmissions by balise, loop, radio, and national signalling equipment
- modules to record and review all logged information.

TEST BENCH FOR RADIO BLOCK CENTRE

The simulated RBC in our ERTMS/ETCS Traffic Simulator can be substituted by your RBC allowing you to test the RBC.

TEST ENVIRONMENT

Our RBC Test Bench test environment is made up of several modules:

- a **route map** showing static information including track topology and infrastructure elements, and dynamic information including train movements and changes of signal aspects and point positions
- **multiple train modules**, all independent from each other, running manually or automatically, and all equipped with train dynamics and EVC simulation compliant with baseline 2 or baseline 3
- a **generic interlocking** system regularly updated with track occupation information is used for setting, locking and release of routes
- a **recording unit** to log all information in real time and display the results
- a traffic management module which integrates train path and timetable information for automatic route setting is available.

TEST BENCH FOR CROSS TESTS

Our Cross Test bench which combines both OBU and RBC test benches can be used to test EVC and RBC simultaneously for components from the same OEM or different OEMs. A comprehensive test environment can be created with the optional addition of trains running in manual or automatic mode.



SIMULATION AND TEST EVALUATION TOOLS

Our evaluation tools simplify the task of analysing, displaying and reporting the data generated using our operational and traffic simulation tools, or by third party on-board systems.

BENEFITS

Using our Evaluation Tools will allow you to:

- visualise in detail the results of simulation and testing to verify the outcome and investigate problems
- ensure recorded data and test outcomes are reported consistently and accurately
- minimise the time and effort taken to produce reports for individual tests and complete test campaigns.

THE SCENARIO ANALYSER

The scenario analyser is a highly configurable interface which allows users to review data and follow the train status and environment in fully synchronised views (Text, Routemap, and Train views):

- train location and direction of travel
- signal aspects, points positions, and track profiles
- EVC information: speed, braking curves, current ERTMS/ETCS level and mode, Train interface information, LRBG information, track conditions/gradient profiles, messages exchanged through balise/loop/radio.

By setting Checkpoints, particular points in the test run can be selected for analysis, and search functionality allows users to identify specific messages, telegrams, packets, and variables.

Two reporting modes, which can be customised by users, are provided:

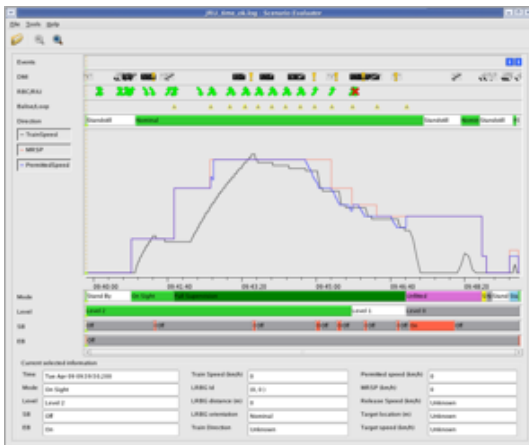
- an overview reporting facility where the results of many tests are compiled into a single file to report a test campaign; and
- a detailed reporting facility where textual and graphical information for individual tests can be reported.

Textual log data can be exported to .XML files; test reports can be exported to PDF, MS Word and OpenOffice.

THE SCENARIO EVALUATOR

The Scenario Evaluator supports ERTMS/ETCS baseline 2 and 3 file formats; and is available as a stand-alone product used to evaluate data from third party on-board systems, or with our operational and traffic simulation tools. The Scenario evaluator allows users to:

- analyse EVC behaviour, including the study of braking curves and driver reactions
- check the sequence of radio messages
- check balise telegrams and loop/radio messages for compliance and correctness
- validate simulation scenarios
- analyse real situations
- test new modules and trial new events.



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