![CLEARSY — Safety Solutions Designer]

CLEARSY'S TOOLS:
A BENCHMARK
FOR ERTMS & ETCS

CLEARSY IS A FRENCH COMPANY 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.
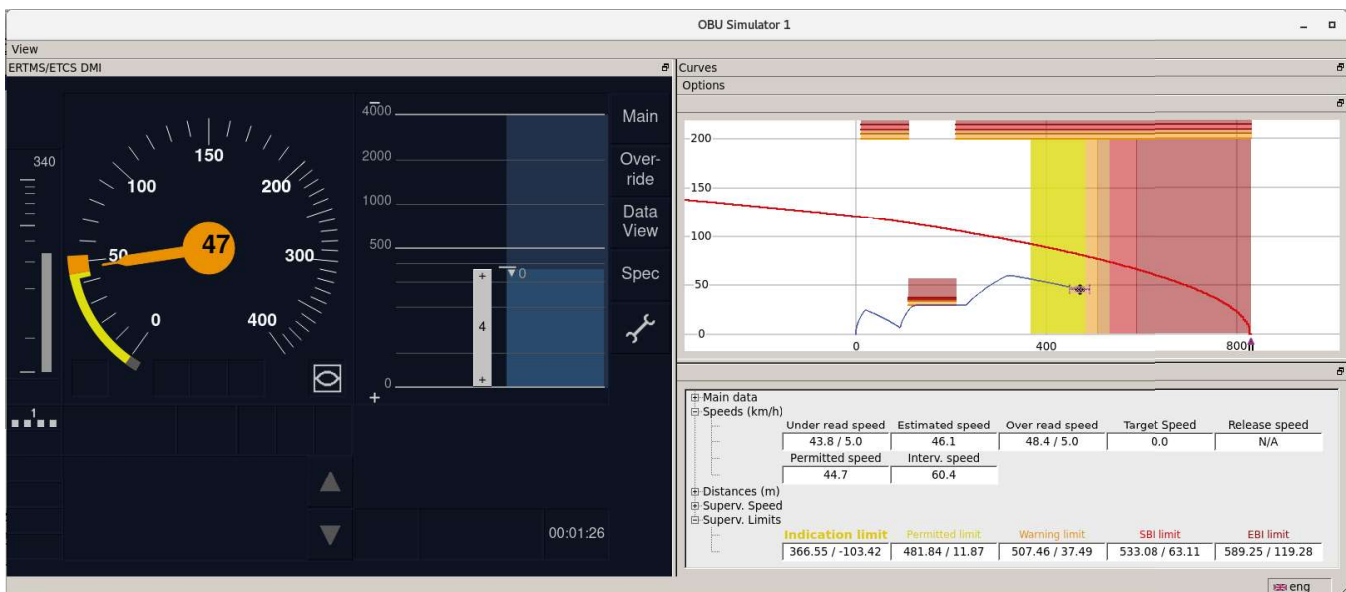
Since the acquisition of ERSA (European Rail Software Applications) in 2018, CLEARSY is offering products and services related to ERTMS/ETCS. Those include simulation tools for testing (on-board or trackside components or both) and for training of signalling engineers or train drivers. They include also reference tools such as a fully compliant implementation of the ETCS on-board functions and the Driver Machine Interface compliant with SIL2 requirements.

CLEARSY is actively preparing the future and works on the extensions of its products to reach a compliance with the next version of the system (Technical Specifications for Interoperability), to be issued at the end of 2022.

ERTMS/ETCS on-board simulator

The CLEARSY on-board simulator (also named EVC simulator) is implementing all functions described in SUBSET-026 concerning the on-board parts, including also the DMI functions in compliance with the ERA specification. It is a functional but non safe implementation installed on its hardware or delivered in a virtual machine.
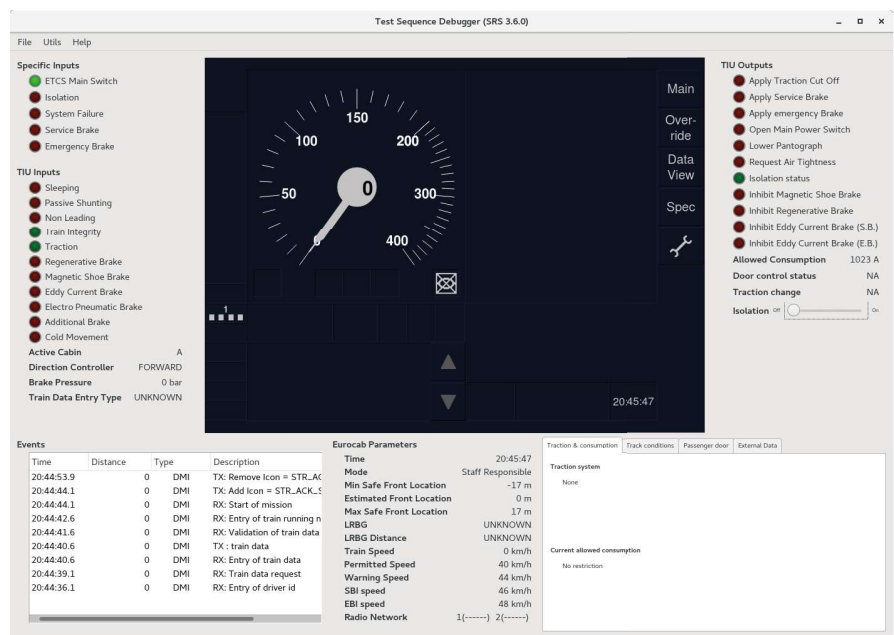
Using this On-board Simulator will allow you to prepare test cases/ scenarios and run them in real time against the simulator in a lab environment compliant with SUBSET-094 or SUBSET-111-2 and collect the

juridical data generated by the simulator and analyse them.

When the simulator is installed in a train, we can interface it with train and trackside equipment and acquire data generated by the trackside components of a track for the purpose of measurements.

For the exchange of information with trackside components, the simulator is basically using the data in the format described in chapters 7 and 8 of SUBSET-026. The value of this simulator can be further enhanced by extending it to include:

- the Euroradio layers as described in SUBSET-037
- balise telegrams encoded according to SUBSET-036.

ERTMS/ETCS operational simulator

The CLEARSY Operational Simulator provides a real-time visualisation of the train running under ERTMS/ETCS supervision.

Using this 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 the 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 the 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 true complexity of the railway system is embedded in the ERTMS/ETCS Simulation System which can be used with several built-in predefined simulation scenarios, or to give you the flexibility to define and explore own scenarios: ETCS telegrams and modulesmessages, 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, a train dynamics module, an EVC simulator, an ETCS Driver Machine Interface and a trackside simulator.

The value of this simulator 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
- radio communication according to SUBSET-037 through an ISDN board
- a joystick to control train movements, and a keyboard for operator inputs.

ERTMS/ETCS traffic simulator

The CLEARSY 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.

Using the 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 true complexity of the railway system is embedded in the Traffic Simulator which can be used with several generic trains, alternatively you can define own train and use that alongside a set of user configurable modules
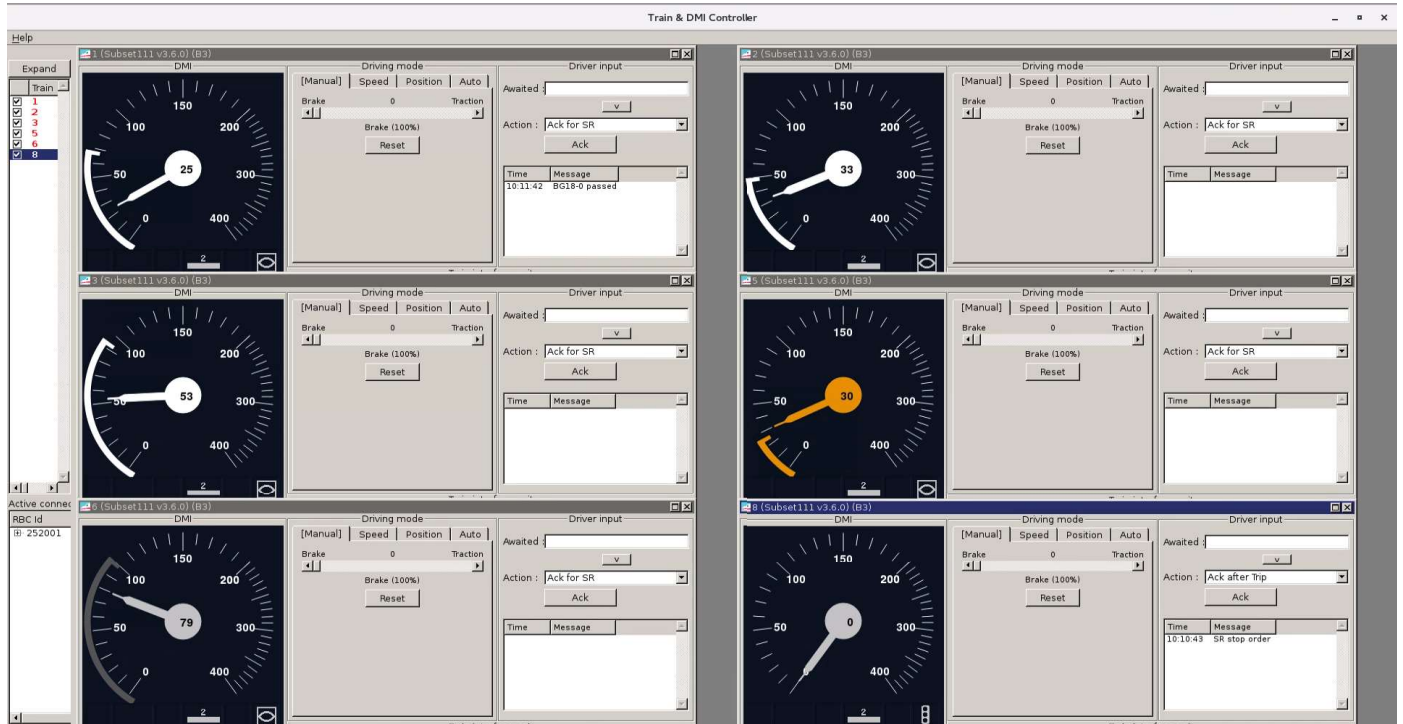
Test benches for ERTMS/ETCS components

CLEARSY's test benches provide:

- a proven route to validating an On Board Units and Radio Block Centre equipment against the ERTMS/ ETCS standards avoiding costly retesting at the product approval stage (compliant with the Reference Architecture defined in SUBSET 094 and SUB-SET-111-2)

- the tools to test and approve ERTMS/ ETCS equipment independent of the OEMs,giving the Infrastructure operators and train operators the confidence, they need.

The CLEARSY 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.
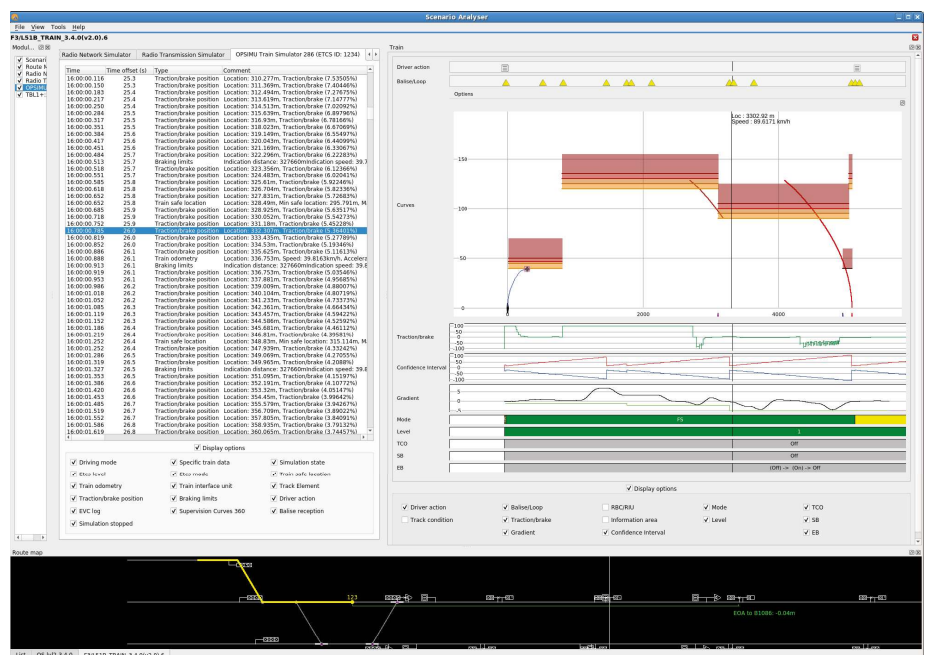
clearsy

Safety Solutions Designer

> THE MORE AUTOMATED THE SYSTEMS ARE,
> THE MORE RELIABLE AND SAFE THEY HAVE TO BE.

CLEARSY has been innovating for 20 years by designing and deploying safer systems, based on the software tools and secure computer we develop.

VITAL RELAY	
AUTOPILOT SYSTEM FOR AUTONOMOUS MACHINES	**SAFETY**
NETWORK	

	COMPUTER
SAFETY	SUPERVISION
	FORMAL MODELLING AND MATHEMATICAL PROOF

Energy/Nuclear Transport Defence

25% Exportation

Software Hardware Safety

Turnkey industrial Equipment Supplier

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