

# Advanced software systems for railway signalling and operations

**RailProfessional, December 2012**

*Tim Gray*

**Tim Gray discusses how TRE's software systems are being used in an increasing variety of ways to enhance safety, improve performance and reduce project risk**

Recently rebranded as TRE, The Railway Engineering Company already has a long and successful history in the UK railway industry through the use of its simulation tools for training and competence management. The new corporate strapline however – simulate, validate, control – gives some clues to the ways in which the product range and its usage is developing.

## **Simulate**

TRE's full-fidelity simulators (TRESim) provide one to one representation of the live operating systems and have been used for many years by Network Rail for training and regularly assessing signallers in operating complex electronic signalling centres throughout the UK. Over 100 replica simulations of signaller workstations for control areas have been supplied, including those fitted in the new regional operating control centres (Rocs) that are key to Network Rail's signalling strategy. These installations incorporate accurate models of the interlocking, the exact workstation screen layout and controls, driver/signaller communications, current timetable, track topology and train performance.

The simulators are now a regular part of the training curriculum for signallers as they practice the routine tasks in controlling trains and, crucially, emergency and perturbation scenarios in a safe, off-line and totally realistic environment. The signaller is constantly observed and monitored during each session by a trainer/assessor who has the ability to change the session from a normal situation to one involving a failed train, faulty points, signals and track circuits, Spad or adverse weather conditions.

Typically the TRESim products are installed as part of area re-signalling schemes. TRE works closely with OEM suppliers, such as GE, Invensys and Delta Rail, to install the simulators well in advance of the commissioning period to allow for signaller training on the new scheme. Beyond the initial warranty period, we provide continued support to Network Rail directly to ensure that infrastructure and timetable changes are reflected so that the 'live' railway model accuracy is maintained.

The power of the TRE simulators has been recognised in international markets too, with systems now active in Sweden, Norway, Germany, Italy and Japan. The Norwegian application is particularly novel, whereby three workstation simulators are integrated with six driving cab simulators (from Sydac) providing a virtual railway system training suite at the Norwegian Traffic Management training facility, Norsk Jernbaneskole in Oslo.

## Validate

While the original safety and business case for full-fidelity simulators was the training and on-going assessment of signallers, their accuracy has opened up a number of other uses. As stated above, via complex modelling techniques we are able to replicate the exact signalling infrastructure of any part of the running railway network, including station areas, yards and depot facilities. These can be modelled and changed in a ‘virtual’ way to fully test the integrity of the design, operation and performance of new or revised systems prior to committing to a particular engineering solution, including stage works and multiple phases of the project. This enables specifiers, designers and project managers of major schemes to evaluate prior to implementation, reducing both technical and programme risk from an engineering and operational perspective.

Where an area is already modelled in TRESim, minor modifications to control schemes, layouts, timetables and other operational approaches can be quickly and easily evaluated. On larger schemes we can develop the model from first principles including an evaluation of human factors issues around user interfaces – for example the workload effect of allowing a larger geographic area to be controlled on one workstation by a single signaller during periods of reduced traffic. Use of simulation and modelling during the GRIP 1-4 stages of new signalling schemes is recommended to allow the projected layout to be tested by signallers and the capacity tested with the proposed timetable for any pinch-points and high-risk elements to be identified before the design is committed.



A recent example is TRESim being used to provide a realistic simulation of the proposed revised control for the London Bridge area to enable NR to de-risk the Thameslink signalling project. TRE provided simulations to give a faithful representation covering the three proposed workstations for amended line-of-route control. Signallers are able to assess the future operation of the system with current train movements and operational characteristics based on stock now working in the Thameslink area, as well as the proposed rolling stock and ultimately simulating the 2018 timetable, operating at 24 trains per hour.

Additionally, our advanced data communications protocols mean that novel regulation and supervisory systems can be tested in the simulated environment for prototyping and proof of concept without affecting operational performance on the real railway. This is exemplified on Network Rail’s Traffic Management System Programme where TRESim is being used as the

prime evaluation platform against which the three TMS suppliers' prototype systems will be evaluated.

## **Control**

TRE has expanded its range of solutions into the real-time control of the railway to assist signallers in their day-to-day decision making via the SIL2 Signallers' Assistant product, known as TREsa, enabling signallers to control a wider area, more consistently and efficiently and helping at time of disruption.

The TREsa system has been designed and developed to meet the new Network Rail ARS+ specification (NR/L3/SIG/10120) for automatic route setting. Initially developed in conjunction with the rail operators and a signalling supplier, TREsa allows the operators to configure, select and test variations in operational parameters on a minute-by-minute basis to meet the local operational requirements. This new flexible functionality provides the signaller with a unique tool to actively manage the railway. TREsa has been designed with the hooks in place to facilitate integration with modern signalling control systems. These systems are now going live across the country as part of a programme of upgrades. TREsa is currently working in combination with GE's MCS control system in the East Kent Signalling Centre and will shortly be up and running in the East Midlands Control Centre at Derby working with an Invensys Westcad on the Trent project.

Looking to the future, TRE will continue to invest in R&D to further develop its product range and seek ways in which to exploit the features of the current systems and knowledge of our people, both in the domestic and increasingly in overseas markets, helping our customers reduce cost, increase reliability and enhance capacity.