



Prologue

A better ETCS onboard, no more, no less

Over the past two decades, the idea of an open railway network across Europe has made significant progress. A tipping point has been reached. **All European countries are now planning the roll out of ERTMS.** The system is not only seen as enabling an open market, but also as a necessary technology for maximizing both passenger and freight capacity, and reducing the environmental impact of European transportation.

Among all modes of transportations, trains offer a unique combination of environmental and capacity efficiency. In the coming battle against climate change, they can offer a great contribution, especially if they can circulate across Europe as easily as road trucks or buses currently do. Furthermore, rail offers already safe automation opportunities (e.g. driverless modes) that can be leveraged to increase capacity even more.

But as the urgency for deploying ETCS grows every day, railway operators struggle.

"To put it simply, for an operator like us, installing, upgrading and maintaining ETCS or similar signalling systems is too expensive, too slow, too difficult, and overall, too inflexible.



Railway is a world where customization is often necessary, and upgrading current systems is often technically impossible or prohibitively expensive. The current 'one-size-fits-all' approach taken by many vendors simply does not work for the railway industry.

We need a different model where we can buy standard components that can be licensed once, then configured at a reasonable cost by engineering teams or contractors.

... And all that at a reasonable and predictable life cycle cost."

Bruno Vanlede, Lineas

A joint venture between railway signalling systems experts and a freight operator, The Signalling Company was created to address these challenges. It starts by providing a competitive ETCS onboard solution.

Chapter 1

Unlimited and free-of-charge ERTMS Baseline updates

ERTMS is a software system that must be adapted over time. In a world where software as a service is becoming widespread, ERTMS Baseline updates must be delivered without the need of a product redesign, or any significant investment. ERTMS Baseline updates should be as easy as updating your smartphone, almost invisible to the end-user. The current policy of “freezing the specification” simply cannot work.

Current ERTMS market offers are tied to an ERTMS Baseline. They cannot be easily upgraded without going through another offer and attached costs.

The Signalling Company is changing the nature of ERTMS upgrades.

It offers free-of-charge ERTMS Baseline upgrades in its standard maintenance contract. This enables the end users to secure their investment in ERTMS, by having a warranty of support for all future Baselines.

“The key technology behind such a radical business model change is the ERTMSFormalSpecs (EFS) modelling language, a Domain Specific Language that allows the production of an immediately executable model of the ERTMS specifications, without any intermediary code generation, manual or automated.

Such a model-based approach shortens the management of changes made to the system baseline and enables the use of formal methods to accelerate their certifications.”

Laurent Ferier, EFS creator



The Signalling Company has developed a Subset-026 compliant EFS model, complete with its Subset-076 automated test suite.

The Signalling Company has started to discuss ERTMSFormalSpecs licensing agreements with other companies entering the ETCS onboard market, to enable these competitors to share the benefit of the free Baseline upgrade movement with their customers and also enter the ETCS onboard market much faster and with much lower investment. Such competition will benefit the end users.

Chapter 2

SIDE for Safe integrated development environment

The next bottleneck that prevents large-scale ERTMS roll-out is the difficulty of the engineering required for every project, and the lack of availability of qualified ERTMS integrators on the market. Installing the ERTMS on a vehicle is a complex task that involves very skilled people in a labour market where resources are scarce. It is a mix of safety and engineering where any error could have catastrophic consequences.

This is where the second innovation from The Signalling Company enters the picture: the supply of a Safe Integrated Development Environment (SIDE) that reduces the complexity of ERTMS installation, so that actors experienced in ERTMS system engineering can rapidly produce quality designs.

SIDE also enables third parties to develop safety or non-safety related applications, adding to or modifying functions of the generic ETCS onboard solution. This allows to better serve all the individual needs on the market.

The closest analogy is that of smartphone apps, whereby major players have created an ecosystem of vendors for “Apps”, that are distributed on the various “App stores”. Such an ecosystem was key for the mass deployment of smartphones. Without Apps, smartphones are limited to the few functions supplied by the vendor.

The same goes for an ETCS onboard product. Without customized functions to suit every kind of vehicle and operational need, an ETCS onboard is just a braking system. With SIDE, its potential becomes virtually limitless.

“A typical use case of apps are class B systems.



Class B systems are legacy signalling systems, that often need to co-exist with ERTMS in some countries. These Class B systems are another bottleneck for the global ERTMS rollout, as they make ERTMS installations more complex, more expensive and more difficult to get approved by the safety authorities.

Some Class B systems that use Eurobalises or similar technologies (for instance TBL1+, KVB and ATC2) can easily be implemented inside a pure software App. Even Class B systems that require extra sensors (like the German PZB or Polish SHP class B systems) can be implemented by adding a specific sensor to the ETCS onboard and configuring the App to use that sensor.

Without Apps, there is no easy solution to the challenges posed by Class B systems.”

Stanislas Pinte – CEO of The Signalling Company

Chapter 3

Over-the-air Software Update

One more innovation is required to enable such frequent software updates: safe, over-the-air ETCS onboard software updates.

This innovation is not only critical to reduce to the minimum required effort and time needed to update ETCS onboard software after a bugfix or an improvement, but also to keep down the price of the yearly maintenance contracts, that are another big part of the ERTMS onboard total cost of ownership.



"Over-the-air software update is a best practice in driverless metro systems, where fleet software updates must be done within very limited time frames, and where access to onboard computers is difficult.

But this feature is equally attractive for private operators who have a fleet constantly scattered around Europe. Avoiding a return to the depot reduces cost and saves energy."

Christophe Lechevalier – Software Director of The Signalling Company

One can even dream about a future in which ERTMS-equipped vehicles could receive a new app during an over-the-air update that would give them access to the Class B system of a new territory without the need to go to a depot.

Chapter 4

Simplified hardware

Current ETCS onboard architectures are obsolete. Designed with technological constraints from 20 years back, EVCs are big, heavy, and export inflexible constraints that cannot always be reasonably fulfilled by vehicles.

These characteristics make the task of customizing EVCs even more difficult, inducing additional costs at all levels, and increasing the time needed to install, service or upgrade an ETCS onboard solution.

The Signalling Company concept for a better ETCS onboard device is to make installation design as simple as possible. The iEVC is made of DIN-mounted modules, all communicating through Ethernet. Each module shall meet the environmental constraints for rolling stock installation.

Physical interfacing is handled as close as possible to the interface point by dedicated modules. The purpose is to limit cabling as much as possible. Software updates, be it safety-related or not safety-related, are coordinated by the iEVC vital computer module.

The purpose of this architecture is also to allow features and modules to be added or replaced in a controlled manner, limiting the re-certification to no more than what is needed.



"So far, it is a headache to embed inside the ETCS onboard features that are not mandated by the legal framework (the TSIs). Ideally, such features should be tailored by installation teams to the bespoke needs of a customer. Typical examples include GPS, telemetry, maintenance systems gateways, train recording units, passenger information, etc."

"By making module physical interface as basic as possible (DIN, Ethernet), and by enabling controlled software changes through a dedicated development environment, not only cost and complexity can be put under control, but obsolescence can be better managed."

"We can take the example of GSM-R radio systems, which will be obsolete within the next 7 to 13 years. We will be able to replace the GSM-R interface module by replacing a DIN-mounted module with another one."

Alexandre Betis – CTO of The Signalling Company

Thanks to the availability of SIDE, giving access to the integrators to change/update all elements of the safe application software, the “untouchable” elements are reduced to their bare minimum: the safety computer, the speed sensors and the Eurobalise reader.

What's next

The Signalling Company is bringing to the market key innovations. These innovations are engineered to optimize the speed of installation and update and maintenance of signalling systems, especially ETCS onboard systems. This optimization is critical for both economic and environmental reasons.

Concretely, The Signalling Company will release its ETCS onboard product in February 2024.

It will revolutionize the ETCS user experience with game-changing features such as:

- Unlimited Baseline evolutions
- SIDE (Safe Integrated Development Environment)

- Safe over-the-air software updates
- Simplified hardware architecture in line with OCORA

The story is unlikely to stop there, though. ETCS is already planning to add automation to its protocols, slowly moving toward driverless trains.

And the need for a better onboard vital computer platform far exceeds the boundaries of the ERTMS world.

Contact us at info@thesignallingcompany.com if you want to be part of this story, be it as a customer, an employee or a partner. It all starts now.



Contact

