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The ERTMS in 10 questions

1. Sometimes we talk about the ERTMS and sometimes the ETCS. Are they one and the same?

The ERTMS (European Rail Traffic Management System) currently features two basic components:

- GSM-R based on the GSM standard, but using different frequencies belonging to the railways, along with certain advanced functions. This refers to the radio system used to exchange information (voice and data) between trackside and on-board.
- The ETCS (European Train Control System). A train-based computer, the Eurocab, compares the speed of the train as transmitted from the track with the maximum permitted speed and slows down the train automatically if the latter is exceeded.

The ETCS therefore forms an integral part, as it were, of the ERTMS. A third “layer” relating to traffic management proper is currently still in the demonstration phase on a North-South corridor of the trans-European network (Rotterdam - Milan) within the framework of the Europtirail pilot project.

2. How does the ETCS operate?

With ETCS, the track sends information to the train enabling it to calculate continuously its maximum permitted speed. On lines where there is trackside signalling (lights and traffic signs allowing the driver to know the permitted speed), this information can be forwarded by standard beacons (Eurobalises) located along the track . This is what is known as ETCS level 1.

For ETCS level 2, information can also be forwarded by radio (GSM-R) and it is no longer necessary to retain trackside signals. This allows substantial savings in investment and in maintenance. The position of trains is still detected by trackside systems. Lastly, for ETCS level 3, the train itself sends its rear end location, making it possible to optimise line capacity and further reduce the trackside equipment.

For all levels, a train-based computer, the Eurocab, compares the speed of the train with the maximum permitted speed and slows down the train automatically if the latter is exceeded.

3. How much does the ETCS cost?

The ETCS consists of two modules, one trackside and the other on board. The trackside module transmits information which enables the on-board computer to calculate, at any given moment, the maximum permitted speed. The on-board computer slows down the train automatically if this speed is exceeded.

The cost of the onboard module depends on the type of locomotives or train sets. In terms of an order of magnitude, this cost would be around €100 000 for new equipment. Prices vary between €200 000 and €300 000 when existing equipment has to be adapted. On existing rolling stock the main problem is finding adequate space to add new antennae on the trains or a new screen in the driver's cab. Compatibility studies involving existing systems so as to ensure that one system does not cause interference to another (questions of electromagnetic compatibility) are also highly complex.

On the track, everything depends on traffic density and the way in which certain costs are attributed. Indeed, the fitting of ETCS will often involve the complete renovation of the line. For this reason the range is rather wide, and estimates vary between €30 000 and €300 000 per kilometre. An analysis on a line by line basis is necessary in order to produce exact estimates.

An overview of the most recent calls for tender shows that costs are falling sharply. The ETCS will allow infrastructure managers to make substantial savings once a sufficient number of trains are fitted out to enable the old systems, which are very expensive, particularly in terms of maintenance, to be withdrawn.

4. What would be the financial implications of implementing the ETCS over the entire trans-European network?

In terms of an order of magnitude purely for information purposes, preliminary estimates are currently around 400 and 500 million per year for ETCS deployment, i.e. some 5 billion over the next 10 to 12 years to fit out a significant subassembly of the trans-European network. The bulk of the costs may be focused on the period 2007-2013. Naturally, the exact outlay will depend on the transition speed and the technological choices made. One of the European coordinator's tasks will be to refine these forecasts.

By way of comparison, in the 15 "old" Member States approximately €13 billion was invested annually in railway infrastructure (trackside alone) on the trans-European networks during the period 1996-2001. Signalling accounted for between 5 and 10% of this investment, i.e. about €1 billion per year.

The figures currently available show that ETCS costs are similar to or a little higher than those of equivalent systems. The larger the scale on which the system is deployed the greater will be the fall in costs. Frequently, however, the ETCS will need to be superimposed upon the existing systems during a transitional period: the existing system on any given line can only be removed once all the trains have been fitted out.

The cosignatories to the Memorandum of Understanding undertake to equip lines and rolling stock in sufficient numbers to ensure that it quickly becomes possible for trains equipped solely with the ETCS to use large interoperable corridors. The whole point should be to reap the fruits of the ETCS sooner than would be possible through a strategy based on the installation of the system only on new lines and rolling stock.

To a large extent, therefore, the cost of implementation will depend on the deployment strategy. The keener we are to establish the ETCS as the sole system the sooner we will benefit from the ETCS, particularly in terms of maintenance cost savings and savings on costs associated with the multiplicity of systems; in addition, however, the greater will be the need to equip existing lines, locomotives and train sets with the ETCS system.

The optimum solution is therefore to be found somewhere between, on the one hand, the number of lines and trains already equipped with national systems and needing to be equipped with ETSC and, on the other, the benefits accruing from the fact of getting a single system sooner. Indeed, one of the aims of the Memorandum of Understanding is to define, with the help of the European coordinator, precisely what the optimum strategy should be. The task will be to analyse the situation, corridor by corridor, and to determine the best possible method and timing for launching and completing the transition. The studies, to be carried out under the aegis of the coordinator, will need to identify the costs and benefits for the various players.

5. What benefits will the ERTMS bring to passengers?

Passengers using the high-speed Thalys train between Paris and Brussels are unaware of the fact that it has been necessary to install seven signalling systems, thereby generating additional costs and accentuating the risks of breakdowns.

The increase in the number of systems takes the form, in particular, of the superimposition of screens in the cabs. Under the traction units it will also be necessary to install sensors (antennae), normally one per system. Problems associated with driving ergonomics, electromagnetic compatibility and positioning also arise in rapid succession. Transitions from one system to another are never simple. Expensive studies will need to be carried out for each combination of systems and for each type of train or train set.

The existing situation is therefore incompatible with the burgeoning of international freight and passenger traffic. Above all, the development of this system forms part of a development strategy for international rail traffic.

At the same time, GSM-R, inasmuch as it facilitates communications by rail, can also be used for a wide range of applications affecting passengers, particularly in the field of information.

As far as safety is concerned, accidents associated with signalling are still, unfortunately, an all too frequent occurrence in Europe. Individually, these accidents do not reflect adversely on the more than 20 national speed control systems that exist today. Usually, moreover, it is precisely on those lines that are not equipped with such systems that the signalling-related accidents actually occur.

The problem is that these systems, which are developed on a national scale, usually by a single manufacturer for a single client, are too expensive, especially in terms of maintenance. The fact that the ETCS is a standard system using mass-produced components means that costs are falling rapidly. There is every reason to believe that costs will fall to such an extent that it will gradually become possible for many lines, even secondary ones, to be fitted with such a system.

6. What will be the role of the Railway Agency vis-à-vis the ERTMS?

The Railway Agency will, in particular, revise the technical interoperability specifications, which, for example, indicate the exact format of the messages which have to be exchanged between the track and the train. The Commission will also be able to ask the agency for assistance in the evaluation, as far as interoperability is concerned, of projects eligible for Community financial support.

Every two years, the Agency will also carry out a report on the progress achieved in the field of interoperability. Naturally, this report will serve as the basis for the adoption of the appropriate initiatives with particular reference, where necessary, to a review of the deployment plans or funding arrangements.

As far as safety is concerned, one of the tasks facing the Agency will be to collect the investigation reports with a view to encouraging exchanges of experience following accidents and to draw up a report on network safety levels incorporating, where necessary, proposed measures.

7. What are the benefits that satellite navigation and Galileo will bring to the ERTMS?

Satellite navigation is destined to revolutionise the rail sector, which has a “structural” need to know the position of every train and every wagon. This will represent a fundamental contribution to the management layer of the ERTMS. As regards signalling (cf. ETCS), the simple fact of knowing for sure, and in real time, the exact position of each train will enable considerable savings to be made. At present, this function is fulfilled by using highly expensive trackside equipment.

In particular, at ETCS level 3, which is the most promising level in terms of capacity gains (minimisation of the distance between trains while at the same time guaranteeing maximum security) and trackside installation savings (such as track circuits), the track must be able to identify as accurately as possible, the position of the train tail. This is a technically complicated matter, and satellite technologies could help in finding a solution to this question. The Galileo Joint Undertaking is piloting a number of projects in this area.

8. Where is the ERTMS currently in use?

As already indicated, it should be noted that, apart from the traffic management component, the ERTMS currently features two basic components: GSM-R and the ETCS (European Train Control System).

GSM-R can now be deployed very rapidly, and thus, today, more than 100 000 kilometres of line are already equipped, or are being equipped, with GSM-R.

Deployment of the speed control component (ETCS) is slower. Indeed, the existing signalling equipment has a long service life (generally more than 20 years), a factor which is not conducive to a strategy based on natural renewal of the equipment.

However, 6 000 kilometres are already equipped or are in the process of being equipped. Projects are under way in almost all European countries. As far as the high-speed sector is concerned, particular attention should be drawn to new lines such as Madrid-Lérida in Spain or Rome-Naples in Italy. Progress is being made not only throughout the Union but even beyond, inasmuch as our industry has been awarded contracts to set up ERTMS systems in Korea and Taiwan. China, India and Japan, among others, have also shown interest in the system.

9. What are the consequences of implementing the ERTMS at operational level?

Above all, the implementation of the ERTMS provides increased security for train drivers by ensuring continuous monitoring during train operation. With the ETCS, i.e. the speed control part, the signalling takes place inside the cabin, which means that signal handling is easier and safer than with the majority of existing systems where drivers have to rely solely on trackside signalling. With the ETCS, the driver is aware at all times of the exact distance he is still allowed to travel. Screen ergonomics has been developed by a working party which included drivers, and harmonised operating rules have also been developed.

These rules have been passed for consultation to both sides of industry and then validated by the drivers using driving simulators.

10. How will a European coordinator be able to promote the deployment of the ERTMS?

One of the major assets of the ERTMS is that, eventually, it will provide trains with just one system enabling them to operate over the entire trans-European network. Given that it is impossible to change all the national systems overnight, steps must be taken to define a migration strategy.

However, the ERTMS cannot be deployed in isolation by just one of the actors involved in the system. Whether the actors in question be a rail company or an infrastructure manager, no matter how important, those actors will need to coordinate their deployment strategy with the strategies of other actors in the system.

Indeed, the migration strategies of individual infrastructure managers will be strongly influenced by those of their neighbours, and the migration strategies of the infrastructure managers will also be affected by the strategies of their clients, the railway undertakings. The railway industry, moreover, has a key role to play, notably in terms of feasibility studies. It will also need to be capable of coping with demand.

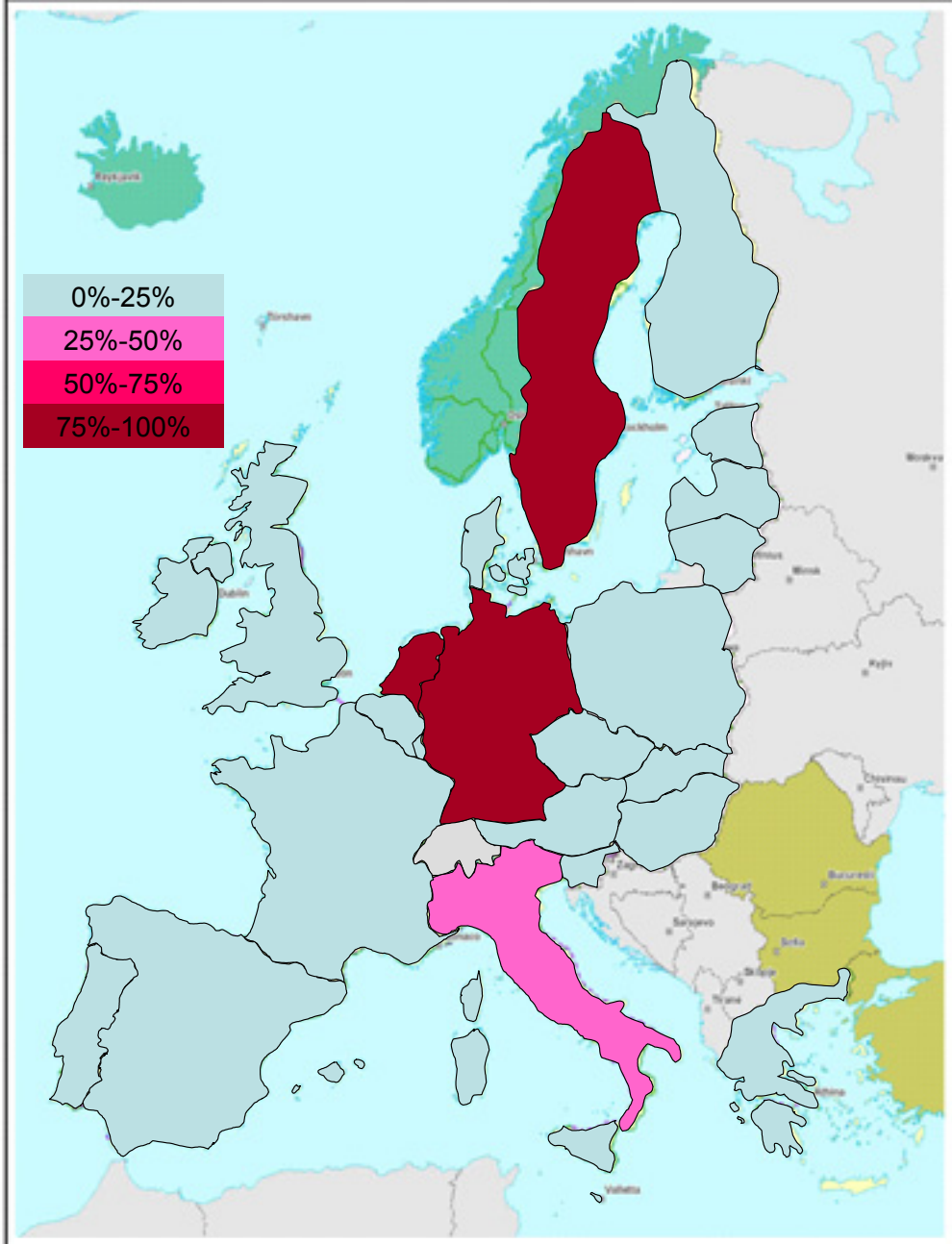
The European coordinator will need to ensure that each of the players involved in the Memorandum of Understanding abides by the ERTMS and interoperability rules. The coordinator will need to identify, in collaboration with the players, the lines or corridors to be equipped as a matter of priority and will also need to guarantee the economic viability of these corridors.

The appointment of the coordinator must be in strict accordance with the rules on consultation, involving mainly the Member States and Parliament. This process has been launched and should be concluded presently.

EU-25: Lines for which commercial use of ETCS is planned before the end of 2008.

Information updated in May 2005.

EU-25: Percentage of main lines equipped with GSM-R mid-2005



EU-25: Percentage of main lines equipped with GSM-R at the end of 2008