Doubts remain over true ERTMS interoperability

Gerard Dalton, infrastructure director with the International Union of Railways (UIC), presents a personal view of the way forward for ERTMS, ahead of the UIC ERTMS conference in Malaga at the end of this month.

THE UIC has been committed from the early 1980s to an interoperable Trans-European Rail Network, in close collaboration with the European Commission (EC) and the supply industry, and an interoperable traffic management and signalling system was one of the very first challenges. The earliest conception of the European Rail Traffic Management System (ERTMS) can be traced back more than 20 years.

During this period, UIC has largely kept faith with the original objectives of ERTMS and has promoted an active migration to the new system while recognising some of the real obstacles and difficulties encountered along the way.

In this article, I will avoid discussing the technical merits of ETCS and the inevitable comparison with existing national systems in terms of its ability to provide a safer and more reliable system with higher capacity. This is because there is no single answer to this issue as a comparison can only be made against a true understanding of each railway's requirements, its planned system configuration and with reference to the system it will eventually replace. Such a narrow assessment fails to grasp the broader objectives of the project.

Nor will I dwell on the role of the railway representative bodies and the European Railway Agency (ERA), as they broadly facilitate, rather than primarily decide upon, the process of actual migration to ERTMS.

To date, the term ERTMS has encapsulated three distinct sub-projects:

- ETCS - European Train Control System
- GSM-R - Global System for Mobile Telecommunications for Railway, and
- ETML - European Traffic Management Layer.

The influence of interlockings on the overall ERTMS architecture for higher application levels has prompted the railways and industry to engage in a joint EU-funded Integrated European Signalling System (Iness) project. This project started in October 2008 and will be coordinated by the UIC, leveraging on the results of past work in the UIC EuroInterlocking project. Iness is expected to develop unified functional requirement based on a convergence of railway signalling principles.

While ETCS is undoubtedly the most complex of the three, it is worth reviewing the success of the other two before setting out the outstanding challenges for the former.

The practical possibilities for ETML were thoroughly explored in two EU-sponsored projects: Optirails and later Europtirails. Rail Net Europe (RNE) has now taken over responsibility for the roll-out of ETML and has a clear objective to have all infrastructure managers in central Europe connected to it in the very near future. A large part of the success of the project is due to the cluster of six adjoining railways which were the early implementers and which set realisable objectives by opting to establish a data exchange and monitoring system between their existing traffic management infrastructure.

GSM-R has benefited from at least four supporting factors:

- the decision to base the rail system on GSM
- railways were already anticipating a move from analogue to digital technology
- telecommunications increasingly forms the backbone of many existing and new customer services, and
- relationship building between the telecommunications industry and railways.

Because of this, the extent of GSM-R implementation in Europe is impressive, with more than 65,000km of network constructed (see map), 25,000 activated

mandatory system which the European railways must implement. This has influenced the normal client-supplier relationship in terms of freedom of choice.

Industry now needs to be more innovative in facilitating railways to achieve a truly interoperable system at an affordable cost. On the face of it, any industry faced with the opportunity to supply a unique product to a captive market should benefit from lower development costs and economies of scale in production, albeit at the risk of consolidation of some players in the market.

The railways need a united, comprehensive and pragmatic migration strategy over the medium and long term. This strategy needs to be endorsed by a critical mass of infrastructure managers and operators, ideally within a 'Central European zone' where the benefits of interoperability can be best exploited. Such a joint strategy will require compromise, a subordination of pure national interest, and should embrace joint or at least coordinated procurement over an extended period of time to secure the best deal from suppliers.

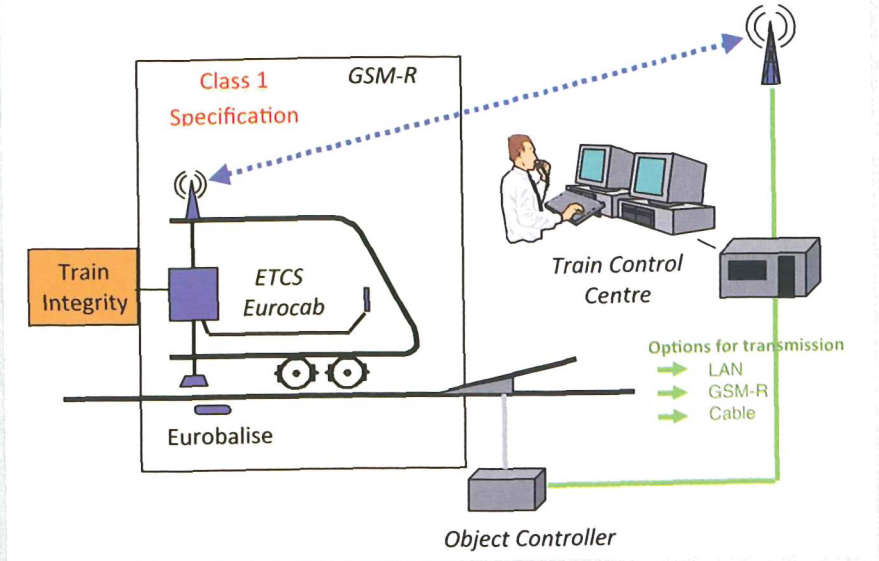
The initiative of the railways, industry and EC to concentrate effort on six nominated corridors, under an EU-appointed ERTMS coordinator, is a positive step in this direction. However, to date, only 1000km of the 15,350 route-km on these six corridors have been commissioned with ETCS.

The EC should work with the Council of Ministers and the European Parliament to create a sizeable financial stimulus package to ensure a more rapid deployment of ETCS, as part of a larger rail development programme. Clear conditions should be attached for all players, in a similar way to the financial rescue packages that are being currently worked out by national governments with banks and the car industry. Funding needs to be concentrated on real priority areas of capacity demand which will produce long-term benefits.

After 20 years of effort, the ERTMS project has delivered a scaleable and effective signalling solution for both new high-speed and conventional lines. Future releases of the specifications will introduce refinements and added functionality to facilitate easier migration, in an existing signalling environment, and to reap benefits from using pre-equipped trains on low traffic routes, using reduced trackside infrastructure (see panel below).

All the indications are that ERTMS can and will be a flexible and robust solution for the future, nationally. Questions of affordability and commitment still hang over the grander ambition of ERTMS, to be a truly interoperable system for international traffic. These questions will remain, if the leading players do not see it in their joint interest to build a stronger alliance. **IRJ**

Sweden launches ERTMS Regional



THE first pilot operation of ERTMS Regional will take place in Sweden this summer. The basic aim of the ERTMS Regional concept, pioneered by the UIC and being applied in a real application by Sweden's infrastructure manager Banverket, is to provide cost-effective solutions when renewing or introducing signalling equipment on regional and local lines.

ERTMS Regional is a trackside-based system for interoperable and standardised communication with rolling stock over the air gap, according to the control, command and signalling technical specifications for interoperability (TSI). Interoperability and intra-operability with ERTMS onboard equipment is ensured so that railways can use ETCS-equipped rolling stock on both main and regional lines (see diagram).

The principal features of ERTMS Regional are:

- onboard standard Eurocab and air gap Eurobalise and GSM-R
- onboard check of train integrity using operating rules or a technical device
- trackside train detection devices as an option for special locations
- no lineside signals
- fewer station staff
- less trackside equipment (eg no complete radio coverage)
- integrated interlocking/radio block centre/traffic management system with one data model instead of traditional interlockings
- fall-back ensured by rules and regulations, and
- safety based on a tolerable hazard rate.

Banverket adapted the original UIC concept as a basis for the replacement of its legacy systems on rural routes, which consist of old interlockings without line block systems or automatic train protection (ATP) and with manual dispatching by telephone.

A framework contract was awarded to Bombardier in March 2005, following competitive tendering in 2004, to develop the new system for installation on 1250km of rural lines up to 2015. The first pilot operation will take place this summer on the 134km Repbäcken - Malung line in central Sweden which has five stations and is used by 16 trains per day at a maximum speed of 90km/h.

UIC will continue to provide technical assistance to Banverket and has developed draft specifications in line with feedback from the project. The UIC specifications will be finalised in the coming year with the objective of having a Europe-wide, harmonised set of ERTMS Regional track specifications available by mid-2010.

cab radios and 120,000 mobile users. The challenge for ERTMS in the future will be to keep pace with telecommunication innovation where the requirements of the signalling system in relation to frequency bandwidth, interference, capacity utilisation and obsolescence will be key issues.

In contrast, the way ETCS has been implemented clearly demonstrates that a coordinated cross-border migration strategy was not an immediate priority for the networks. Implementation has been largely based on widely-dispersed projects (mainly on new lines), which has prevented the benefits and requirements of a truly interoperable system from being put to the test (see table and map).

In Europe more than 2500 route-km of ETCS are now in commercial operation and about 1000 traction units have been equipped. A large number of projects are in the pipeline which, if realised, could see the extent of ETCS in Europe rise to over 33,000 route-km and 11,000 fitted traction units by 2030, although this is still a long way from full implementation on the TEN network.

Outside Europe, and taking into account that ETCS has been adapted somewhat to suit local conditions, about 400 route-km are now in commercial operation withe more than 1300 traction units equipped or being equipped. Given the rapid railway developments in China, India, Korea, and Turkey, we can expect the deployment of ETCS to keep pace with and perhaps exceed that in Europe. There are certain ironies in this situation:

- the investment by European suppliers in developing ETCS may be better exploited outside Europe than within it
- ETCS is being adopted by countries that have less demand for an interoperable system than Europe, and
- more innovative adaptation of ETCS may occur outside Europe as European suppliers respond to clients' requirements in a competitive environment, where no mandatory conditions on system choice apply.

Having regard to where we now stand, and taking full benefit of the lessons learned, the following actions seem appropriate.

EU member states should agree on the migration to ETCS by a clear date. Such infrastructure investment must now be seen as a sound choice, with the hindsight of mismanaged financial resources in other areas and given the current macro-economic needs.

The introduction of the single European currency, which is now celebrating its 10th anniversary, would never have been possible without the strong commitment of all the member states involved to a common deadline for its implementation. Similarly, if the ERTMS project is not completed within a reasonable timescale, many current systems will become obsolete and unsupported, and a viable migration strategy will be difficult to find without operational consequences.

Suppliers must engage more actively and inventively in the entire process. The supply industry has participated, as an entity, in the development of a

ETCS in operation in Europe

		Distance (km)	Max speed (km/h)
Level 1			
Austria/Hungary	Vienna - Hegyeshalom - Budapest	257	160
Bulgaria	Plovdiv - Burgas	230	200
Greece	Athens Airport - SKA	40	160
Hungary	Hodos - Zalacséb	27	120
Luxembourg	Ettelbruck - Luxembourg	40	120
	Bettembourg - Volmerange	6	80
	Luxembourg - Oetrange	10	120
	Luxembourg - Bettembourg	11	140
	Luxembourg station		120
Romania	Bucharest - Campina	92	160
Slovak Republic	Bratislava - Leopoldov†	64	
Spain	Córdoba - Malaga†	130	300
	Madrid - Valladolid†	200	300
	Madrid - Barcelona†	670	300
Total Level 1		**1777**	
† *These lines will be upgraded to Level 2*			
Level 2			
Germany	Berlin - Halle/Leipzig	135	200
Italy	Rome - Naples	200	300
	Turin - Novara	90	300
	Milan - Bologna	182	300
Switzerland	Löstchberg base tunnel	35	250
	Olten - Bern	45	200
The Netherlands	Betuwe Line Rotterdam - Zevenaar	110	120
Total Level 2		**797**	

ETCS in operation outside Europe

Level 1			
China	Beijing - Tianjin	116	350
India	Chennai - Gummudipundi	50	80
Korea	Seoul - Deagu	239	300
Total		**405**	

GSM-R deployment in Europe