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Infrabel installing ETCS step-by-step on Belgian railway network

Luc Lallemand, CEO of Infrabel

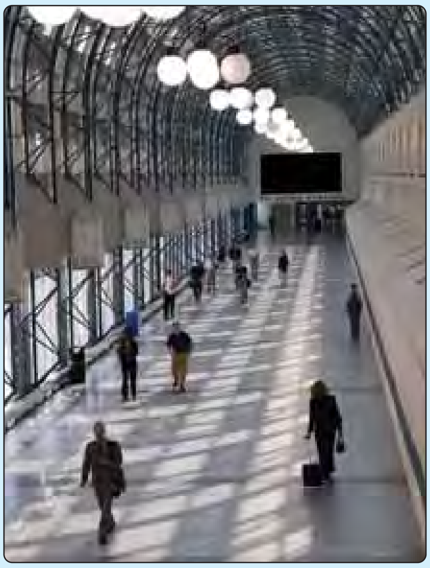
Railway telecommunications and traffic safety

José Pestana Neves, Adviser to the Board of Directors, Refer Telecom and Member of the UIC European Radio Implementation Group (ERIG)

Do I really need an IP/MPLS network?

Over the past decade, commercial telecommunication services have evolved to Internet Protocol (IP) based technologies delivering wireline and wireless broadband connectivity and leading to the explosion of Internet, smartphones and new technologies. What can we learn from this transformation which would benefit the railways industry?

It's one of the questions addressed by Thierry Sens, Director EMEA Marketing, Strategic Industries at Alcatel-Lucent. Based on rail operator experiences all over the world, key findings need to be shared and some will provide the key to move smoothly and securely from legacy technology – TDM or circuit switched telephony – to a flexible, scalable and converged IP infrastructure that will allow the railways industry to benefit fully from multimedia applications for operational and passenger services.



Why IP?

As noted by the International Union of Railways (UIC) in its IP Guidelines for the Fixed Network in Q1 2012: "Reliable and cost-effective data communication has become essential to all important railway operations and services. All railway telecommunications networks are currently migrating towards digital transmissions technologies. A clear path to achieving this vision is to move towards a unified all-IP fixed network. This trend appears irreversible and represents a big opportunity for railway business."

For example, circuit switched telephony is moving to IP telephony with multimedia applications for enriched collaboration and better situational awareness. Video-surveillance applications are now using IP-based cameras for enhanced safety. Train stations are being equipped with WLAN (Wireless Local Area Network) broadband services and new passenger information systems providing real-time multimedia content, transmitted via IP. And those services will also be available on-board, when the new 4G (4th Generation) wireless systems (LTE – Long Term Evolution) are deployed along tracks to deliver wireless broadband services to trains and passengers – all thanks to IP.

Entering into the 21st century means to the railway industry migrating to digitalisation and automation, maintaining high reliability, Quality of Service (QoS) without any compromise on safety and security. This goal leads to a technology transition to a single and simple IP/MPLS network.

Why MPLS?

Enriched with new IP-based services, railway operators have the opportunity to rationalise their communication networks into a single, converged packet based network to support all operations and therefore reduce the total cost of ownership. However, this network needs to support both existing and new applications including mission-critical and passenger services. Therefore, the technology must be flexible, robust, and scalable. IP/MPLS (Internet Protocol/Multiprotocol Label Switching) technology is the only solution that provides these attributes. With IP/MPLS, rail operators can set service parameters for each service according to operational requirements, prioritise mission-critical traffic using QoS to ensure it gets delivered on-time, and support low jitter and delay to handle all traffic in real-time. Traffic engineering allows for selecting the best path for each service but also an alternative path to ensure that any service is quickly re-routed (sub 50ms restoration time) in case of a failure.

Moving to simplicity and cost-efficiency

Alcatel-Lucent's state-of-the-art IP/MPLS solutions have unique additional high availability features like non-stop routing and non-stop services. The IP/MPLS portfolio supports all layer 2 and layer 3 VPNs options. It ensures seamless transport of legacy protocols (V35, E&M, E1/T1…) and applications and provides physical synchronisation with a quality equivalent to SDH (a key feature for GSM-R backhauling). Furthermore, a management platform automates and simplifies network management operations for rail operators. This platform also manages Alcatel-Lucent LTE, optical and microwave solutions that will further enhance the benefits of multiservice IP/MPLS networks.

To join the community of rail operators who have chosen a multi-service IP/MPLS network, who are reducing both initial and operational expenditures while maintaining very high reliability and safety standards, take the first easy step: partner with the worldwide leader!

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Infrabel installing ETCS step-by-step on Belgian railway network

Infrabel, the Belgian railway infrastructure manager, is continually working to achieve a progressive increase of safety on its network. Exclusively for *European Railway Review*, Luc Lallemand, CEO of Infrabel, addresses the strategic interests, the challenges and the most significant achievements with regard to the ETCS Master Plan (European Train Control System) on the Belgian railway network.

Maximum rail safety and interoperability

Since the early 1990s there have been about 20 different signalling systems in use on European railways. These are obviously indispensable for the coordination and safety of railway traffic but in order to put an end to this parallel existence of different systems, Infrabel has resolutely opted for the path of uniform cross-border traffic.

Approximately 4,500 trains (passenger and freight trains combined) travel every day on the Belgian network, including some 150 high-speed trains (Thalys, Eurostar, TGV and ICE). In recent years, and thanks to the strategic Brussels-Midi station (the terminal for the HSTs), the institutional capital of Europe has further developed into a hub for international railway traffic.

> *In order to further cement Belgium's position as a railway hub, Infrabel intends to install ETCS across its entire network by 2022*

In 2011, with a view to achieving the highest possible interoperability and maximum rail safety, Infrabel, in collaboration with railway operator SNCB, developed its 'ETCS Master Plan'. This was presented in the Belgian Federal Parliament on 19 October 2011 to the Special Commission for Railway Safety. This Commission was established after a train accident in Buizingen (Halle) on 15 February 2010, which regrettably claimed the lives of 19 victims.

Master Plan lays foundation for effective safety strategy

Thanks to ETCS, every train equipped with this system can run in any Member State providing that the country also has ETCS installed across its railway infrastructure. This system guarantees permanent control of the train's route and automatically brings the train to a stop should it happen to ignore and bypass a red signal or exceed the maximum allowable speed limit along any given railway section.

In order to further cement Belgium's position as a railway hub, Infrabel intends to install ETCS across its entire network by 2022. Thanks to the implementation of this plan which calls for an investment of some €2 billion (excluding the system's installation on rolling stock), Belgium will assume an enviable position

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Balise installation on the Belgian railway network

The ETCS Master Plan aims to improve the reliability of the signalling system, provide best possible ergonomics for the train conductors, provide complete interoperability and increase the capacity of the Belgian railway network

as one of the top three safest railway networks in all of Europe.

Among its objectives, the ETCS Master Plan aims to improve the reliability of the signalling system, provide best possible ergonomics for the train conductors, provide complete interoperability and increase the capacity of the Belgian railway network.

Migration strategy for the ETCS Master Plan

1st step: current situation

Infrabel is continuing to install ETCS Level 1 (= sending information from the ETCS balises on the tracks to the operator's cab on the train) for those projects that have already commenced with a view to improving the safety of the network.

In this perspective, Infrabel and SNCB continue to work on the accelerated installation of the automatic braking system TBL1+ on the railway infrastructure (to date +/- 83% degree of efficiency of the fitted signals) and in trains (to date 80% of all trains). By the end of 2012, TBL1+ will be installed on all major railway junctions; and by 2013, SNCB will have installed TBL1+ in all of its trains.

TBL1+ triggers an automatic braking mechanism if a train passes a red signal, or if at a 300m distance from a red signal, a train still has a speed of more than 40km/h. TBL1+ uses the same balises and is fully compatible with ETCS.

2nd step: important milestones

By the end of 2015, TBL1+ will be installed across the entire network (degree of efficiency of 99.99%) and by the end of 2022, the entire Belgian railway network will have been fitted with a combination of the ETCS levels 1, 2 and Limited Supervision, where the information is sent using balises. This is a customised solution which allows the user to choose the ETCS functions that need to be implemented in order to achieve the desired level of safety.

By the end of 2023, all SNCB trains will have been fitted with the European cab signaling system ETCS.

An inside view of the ETCS test train

3rd step: final objective

By the end of 2025, only trains equipped with ETCS will be able to use the Belgian railway network.

4th step: possible convergence in the long-term (= to be decided)

In the long-term, (Horizon 2020-2035) ETCS level 2 (ERTMS) will be installed on the entire network with a view to a perfect homogeneity.

In ETCS level 2 or ERTMS, (European Rail Traffic Management System), information is sent from the railway infrastructure to the operator's cab in the train and vice versa using GSM-R: the

European premiere of Infrabel's ETCS test train during InnoTrans 2012

At InnoTrans 2012, Infrabel presented its own ETCS test train 'EM202' to the European public in the presence of Siim Kallas, Vice-President of the European Commission and European Transport Commissioner.

Infrabel commissioned EM202 in 2012, making it the first 'real' train in Europe to be specifically built and equipped for ETCS tests.

EM202 registers and tests ETCS before and after its installation on the Belgian railway network. The 20m-long train can seat five people in the operator's cab and can achieve speeds of up to 120km/h. The train was designed and built by contractors Geismar and Donelli.


A test ride in the ETCS test train at night

digital railway communication network which has been installed across the entire Belgian network since the end of 2009.

> *By the end of 2025, only trains equipped with ETCS will be able to use the Belgian railway network*

Step-by-step deployment of ETCS across the Belgian railway network

Infrabel is gradually installing ETCS across its network: at first, this was completed on the high-speed lines (Liège–German border and Antwerp–Dutch border). As a result, Belgium was the first European country with a completed border-to-border high-speed network at the end of 2009. In spring 2012, the Brussels–Leuven line and the recently inaugurated Diabolo railway link, which has made Brussels Airport one of the best served airports by rail in Europe and in the world, were also fitted with the system.


The ETCS test train on the recently inaugurated Diabolo railway link

Other railway lines will soon follow. Infrabel is also working hard to install ETCS on Corridor C, one of the priority freight railway transport routes which connects Antwerp with Basel and Lyon (Horizon 2015). Infrabel will also immediately install ETCS on the new Liefkenshoek railway link: a direct link for freight traffic in the Antwerp port, which will be commissioned in the summer of 2014.

Thanks to ETCS, all of this railway infrastructure will enjoy increased safety. In so doing, Infrabel wishes to offer all its customers (14 railway operators to date) an even safer and more efficient service.

European steps for the implementation of ETCS

In this respect, the renewed commitment on 16 April 2012 of the European Commission and the entire railway industry (infrastructure managers, railway operators and suppliers) was strategically important. An important declaration of intent was signed in Copenhagen whereby the parties involved committed to install ETCS on all major European railway corridors by 2020.

Copenhagen was an important milestone and we expect Europe to approve 'Baseline 3' by the end of 2012. This most recent standard within the ETCS safety system will offer infrastructure managers a more cost-effective option to switch from a conventional signalling system to the higher security provided by ETCS. Infrabel will install this new version on part of its railway network, in line with its strategy.

BIOGRAPHY

Luc Lallemand has been CEO of Infrabel and Chairman of the Management Committee since October 2004. Luc has a Bachelor of seamanship and certificate of officer of long trade navigation and is also a Commercial Engineer. He has worked in various organisations including Financial Advisor with the Department Treasury of the SNCB (1991-1995), Budget Advisor and Principal Private Secretary with the Minister of Transport (1995-1999), Deputy Principal Private Secretary with the cabinet of the Vice Prime Minister (1999-2002) and Chief Financial Officer with SNCB (2002-2004). Luc also holds the position as Director with bPost, Vinçotte, RFF, RATP DEV (Paris) and is Chairman of the Board of Directors with TUC Rail.

Future-proof data transmission in railway networks

The rules governing signalling and control data networks belonging to railway companies are special. For instance, telecommunications products operate for long periods. As a result, traditional TDM technology is still used in the telecommunications networks today. Furthermore, reliable data transmission, like that offered by the TDM products which have been in service for decades, has top priority. But railway companies are displaying a clear trend towards switching technology from legacy TDM transmission to an Ethernet/IP-based network structure.

Due to the different constraints and the way signalling and control technology has developed, separate cables for legacy modem technology and line-based, dedicated synchronous multiplex systems can co-exist nowadays. These types of network concepts have proved to be extremely reliable for some time, but need some critical re-evaluation today.

KEYMILE's multi-service access platform, MileGate Credit: KEYMILE

Ethernet as the cornerstone

The goal of railway companies is to use a standard, integrated, Ethernet/IP-based data network for all of their data communications and therefore avoid operating parallel networks and isolated solutions. However, rolling out new technologies and methods at railway companies involves scrutinising prevailing conditions and the application's environment in order to ensure dependable and, at the same time, economical operation.

A future-proof Ethernet-based transmission system must satisfy all the demands, whether these involve narrow band, time-critical special services, such as hot-box or train-end monitoring, derailing sensors, or level-crossing control in a wide range of temperatures, or applications requiring a lot of broadband, such as CCTV. The reliability, availability, maintainability and safety of all mission-critical areas must be guaranteed at every stage of the product's life. The use of different media such as copper wire, fibre optics and existing backbone networks needs to be examined in order to ensure both reliable transmission of the digital signals and a response to the increasing demands for transmission speed.

The development of various transmission technologies has always been driven by the rising need for transmission capacity. SDH technology has established itself in the railway segment. It offers transmission rates of 155 Mbps up to 10 Gbps. And optical networks with wavelength multiplex technology, some of which have been implemented, also exceed these figures considerably. With the emergence of LAN technology, Ethernet-over-SDH (EoS) created a bridge for transmission of Ethernet data via the existing SDH networks. Therefore, Ethernet-based services and signal and control technology can also be reliably transmitted in railway networks.

Safety and reliability top of the list

Safety requirements, such as those established in the international IEC 61508 standard, play a key role. As operators of systems with maximum demands on reliability and safety, railway companies carry out risk assessments to determine the safety integrity level for certain areas. Based on these specifications, the suitable components are selected and combined to form a solution. KEYMILE's products comply with top safety requirements and are used by Deutsche Bahn, many Swiss regional railway companies and in tunnels like Lötschberg and Eurotunnel.

KEYMILE makes railway networks fit for the future

In developing new solutions, KEYMILE has been focusing on the special requirements of dedicated networks, particularly for railway companies. The long-standing products, such as UMUX and LineRunner SCADA NG, and the latest developments like the multi-service access platform MileGate, reflect the necessity for flexibility, stability and long product life. As a result, KEYMILE is a professional partner, offering a skill-set to railway companies that are seeking efficient and sustainable telecommunications networks.

BIOGRAPHY

Since 2008, **Klaus Pollak** has been KEYMILE's Head of Consulting and Projects. He is responsible for network solutions for KEYMILE's key customers. Prior to that, he headed the international Product Line Management. Klaus studied High-Frequency Engineering in Hannover, Germany.

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Powering sustainable railway communications

Kapsch CarrierCom, the world's leading supplier for railway telecommunications, is fully committed to the railway world with an end-to-end approach to GSM-R solutions. With a commitment to fulfil customer requirements and shape industry trends, the Austrian-based manufacturer, supplier and system integrator lists the standardisation and field-readiness for ETCS Level 2 via GPRS, the implementation of railway applications to expand the use of GSM-R networks and a sustainable move for GSM-R towards IP as the main subjects of the industry.

Pioneering ETCS Level 2 via GPRS

Kapsch CarrierCom is driving the standardisation of ETCS Level 2 over GPRS and collaborating in the EU-funded field-proving project TEN-T 2011. This concept has the potential to solve GSM-R bottlenecks in dense traffic areas by replacing CSD (Circuit Switched Data) as bearer service with GPRS.

"We are committed to making ETCS Level 2 over GPRS a viable solution for railway operators. Beyond ETCS Level 2, GPRS as a transport solution also opens the gate for innovative railway applications," says Michel Clement, Vice President GSM-R Global at Kapsch CarrierCom. Current forecasts state that field-readiness is to be expected by 2014.

Expanding the use of GSM-R infrastructure with innovative applications

The installed base of GSM-R networks in Europe currently amounts to roughly 85,000km. Thus, many railway operators in Europe are now starting to reflect on the variety of options to expand the use of this network. The motivation behind doing so is threefold. First of all, there is great potential for reducing maintenance costs. Secondly, passenger and employee safety can be improved, and thirdly, operational procedures can be simplified. In order to make best use of existing infrastructure, Kapsch CarrierCom offers a variety of applications for railways in the fields of train operation, such as the shunting application, trackside operations, which includes track worksite warning, personnel safety – the most prominent application being the lone worker protection – and optimisation services.

"We are looking forward to discussing the many innovative options to extend the use of already existing GSM-R infrastructure with railway operators from around the globe," says Michel Clement. "Our goal is to make the most of any railway operator's network, by simplifying and optimising a wide range of operational procedures with the help of GSM-R."

Moving GSM-R sustainably towards IP

Over the past 10 years, railway operators around the world have migrated their mobile communications infrastructure to GSM-R. As mobile communications continue to evolve, many of these operators are now looking to upgrade their networks from legacy Time Division Multiplex (TDM) technology to a next-generation packet-based architecture. As the world's leading provider of GSM-R networks, with full commitment to the railway environment that is also reflected in the above industry average spending on R&D (>10% of revenues are invested in R&D), Kapsch CarrierCom is moving with this trend and is introducing its next-generation voice network solution, based on the 3GPP Release 4 Bearer-Independent Core Network (BCIN) standards.

Kapsch CarrierCom's voice core solution for railways was specifically designed to provide the critical mix of reliability, robustness and scalability that is essential in today's GSM-R industry. Kapsch is the sole GSM-R supplier with live Release 4 networks in Europe and Africa. Among the earlier adopters of Kapsch CarrierCom's 3 GPP Release 4 Core Network are the largest networks of Europe: Deutsche Bahn of Germany and Network Rail of the UK – the latter of which is close to the finish line. Lithuania, Austria, Algeria, Bulgaria, the Czech Republic, Ireland and Poland also trust Kapsch with the implementation of their 3GPP Release 4 Voice Core Network for GSM-R.

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Railway telecommunications and traffic safety

This is the first of two articles dedicated to railway telecommunications and their role in the safety and operation of rail services. Part two will be published in *European Railway Review Issue 1 2013.*

Railway telecommunications – what are they?

Railway telecommunications, in the strictest sense, are a range of systems and applications that, although based on conventional communications techniques and technologies, are specifically designed and configured for use in areas of railway operation directly associated with the running of trains, namely traffic safety, traffic control and electric traction control.

Usually, also included within the scope of railway telecommunications is the so-called 'Complementary and Support Systems'. On one hand, this designation covers conventional telecommunications (and other) systems that generally constitute the support, management and/or supervisory infrastructure for all operational systems and applications (physical media, transmission systems, power supply systems, supervision and management, etc.). And on the other hand, a range of systems that, while not exactly telecommunications in the strictest sense of the word, are, in the railway business, normally related to the technical area of telecommunications (video surveillance, passenger information, time synchronisation, etc.). With regard to these last mentioned type of systems, it should be noted that, with the progressive centralisation of traffic management and control in multidisciplinary control centres, there has been a significant change in the architecture of the systems in question. Actually, they have changed from being isolated and separate local installations to being integrated systems with centralised control, structurally dependent on telecommunications. In other words, these systems, examples of which include video surveillance and public information systems in stations, were first included within the scope of telecommuni-

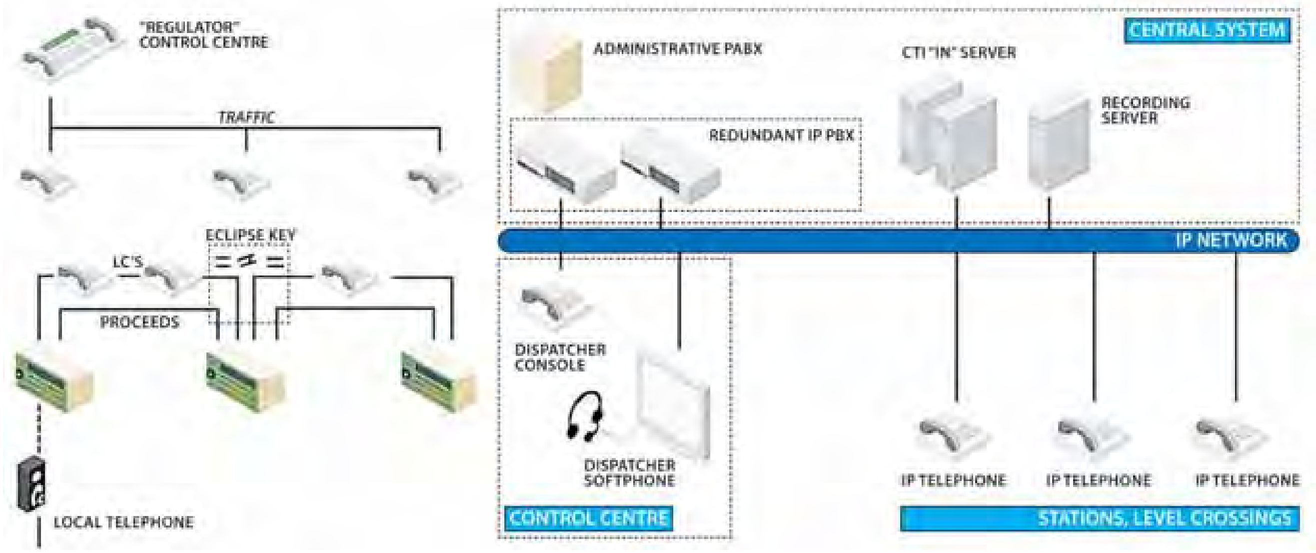

Figure 1: Safety related voice communications at telephone block areas of the Portuguese rail network. On the left side, traditional analogue configuration (over physical lines or TDM systems); on the right side, the very same functionalities over IP Network.

cations just for reasons of technical affinity, but today they are truly structured and conditioned by the communications on which they are supported and on which their effective operability depends.

The 'General Purpose Telecommunications' group is not to be considered as Railway Telecommunications. General Purpose Telecommunications includes all types of conventional communications (voice and data, fixed and mobile) normally provided by a public operator, used in the rail business in management and back office, and even in operations, but which are not dedicated systems exclusively applied to operating and running railways. All the same, Public Telecommunications, such as Mobile Telephony and Internet Access, used on-board trains, namely by passengers, are not to be considered as railway telecommunications. As important as they can be from a commercial point of view, these are not actual railway telecommunications, because they are not related with rail operations.

Traffic safety related railway telecommunications

Railway telecommunications are, by their very nature, intrinsically linked to the models and regulations of railway operation and safety, and in this sense do not have fixed rules; the structure and configuration of networks and the design of terminal equipment must, at all times and in every application, be designed, configured and adapted to operating models and to their changes and developments. Railway telecommunications are not in themselves a technology, but instead an application of different communication technologies, available and suited at any time to the specific needs and problems to which they are called to respond.

Voice communications directly concerning traffic safety are essentially related with train movement authorities, usually in telephone block areas, but also, at special situations, in automatic block areas (for instance, voice authorities to pass a signal at a 'stop' aspect). Depending on the model and regulations in force, these communications will be established between Station Masters (or Local Dispatchers), between a Central Dispatcher and each Station Master, between a Central Dispatcher and the Engine Drivers (being, in this case, usually a mobile communication), etc.

Figure 2: MPLS Data Switch used for axle counters interconnection

Data communications within the scope of traffic safety consist, basically, in the use of the telecommunications network as a bearer for connections between different components of a signalling system (CTC and local interlocking, interlocking and object controllers, pairs of axel-counters, etc.). This type of communication is increasingly replacing the traditional solution of using cables and equipment belonging to the signalling systems themselves, a solution with a significant effect on investment due to the use of copper cables. The use of the telecommunications network presents financial advantages, since it permits a rationalisation and optimisation of resources that need to be put into use, and technical advantages, since the telecommunications network offers redundancies and supervision, reconfiguration and intervention facilities that isolated signalling connections do not.

Of major (and quickly increasing) importance is the use of mobile railway communications systems as a bearer for the interconnection of track-side and on-board equipment of cab signalling and ATC/ATP systems. The most important example of this application (at least in Europe) is the ERTMS (ETCS+GSM-R) system, a key component for the railway interoperability in the European space.

Impact of telecommunications on traffic safety and traffic reliability

The use of railway telecommunications at traffic safety directly related applications raises the question of how communications failures actually impact traffic safety. From the analysis and combination of the concepts of failsafe design of signalling systems, safety procedures and vital data transmission over unsecured connections, it is possible to conclude that the fault or error of any means of telecommunication directly involved in traffic safety causes, in the context of fail-safe logic, a restrictive reaction of the affected system, often involving the stopping of traffic or of the train in question, in order to guarantee that safety is not put at risk. Thus, the intrinsic safety mechanisms of signalling systems imply that communications faults involving these systems do not have a direct impact on safety, but, instead, on traffic availability.

Since the principles of fail-safe operation are also applied to the regulation of procedures associated with traffic safety, in this context a communications fault (for example, in the telephone block system) should also not (directly) cause a safety fault – provided, obviously, that procedures are respected.

In contrast, and as it is easily understandable, this failsafe structure in systems and procedures means that support telecommunications faults, although they do not formally and directly impair traffic safety, do in fact impair the reliability, availability and actual continuity of the rail service.

It cannot, however, be concluded that railway telecommunications, particularly their absence or failure, do not have any type of responsibilities in traffic safety.

A first level of this relationship concerns the role of telecommunications in the transmission of information in the area of prevention or notification of high-risk situations (landslides or other obstruction situations, infrastructure defects, rolling stock breakdowns, malicious intrusion, etc.). In this context, voice and/or data communications may be involved, data communications generally as a transmission bearer for various high-risk situation automatic detection systems. Another aspect, perhaps more significant and which is of interest to further develop here, concerns the role of telecommunications systems themselves and their faults in a chain of events that can lead to safety violations or even to an accident.

These occurrences are, as a general rule, related to deteriorated situations and to emergency procedures – scenarios in which, due to the lower level of intrinsic safety with which operations are processed and/or the natural pressure to restore traffic and the service, human errors are more likely to occur and safety may be impaired.

Figure 3: Communications equipment at an Operational Control Centre (OCC) of the Portuguese rail network

In telephone block system areas, since safety and traffic control operations are directly and exclusively supported over telephone connections, the failure, degradation or unavailability of these connections have a direct impact on the reliability or continuity of traffic. This situation, especially if prolonged, normally leads to the need to use emergency regulatory procedures, including the use of public communications networks, inherently more liable to human error than the private network. And, more seriously, it may lead to the use of non-regulatory procedures, under the pressure of restoring the service and minimising passenger inconvenience. Naturally, any resulting breach of safety, or even accident, has human failure as its direct and effective cause, but we cannot ignore the fact that the initial source of the occurrence (not the cause in the sense of 'blame') may have been due to a communications failure.

In automatic block areas, the causes of degraded situations are, in a high number of cases, related to signalling failures, which in turn may be due, among other causes, to failures in the telecommunications systems that support the internal connections of signalling systems. In this scenario, as already noted above, the fail-safe logic of systems and procedures ensures that safety is not put at risk, but the regularity or continuation of traffic is impaired. This situation may affect, for an unforeseeable period of time, a considerable amount of traffic and passengers, possibly even including 'High-Quality' services.

In addition, it may become necessary to issue authorities to pass signals displaying a stop aspect by telephone or by radio and/or to suspend automatic blocks and set up a degraded system and emergency procedures, with traffic safety based on a system equivalent to the telephone block system. In these situations, there is clearly a greater risk of human error that may impair traffic safety, this risk being aggravated by the fact that responsibility for safety in this degraded situation may be in the hands of Traffic Control Operators of a CTC/OCC responsible for the area affected, who does not have a routine for these situations (in principle, exceptional), and may also have to simultaneously manage several situations of trains blocked at different locations. If a safety violation or an accident occurs in this scenario, telecommunications may be involved at two levels: the initial failure that may have caused the degraded situation and the possible situation of the human error occurred in this degraded situation having been, in some way, induced or facilitated by prevailing communications systems or equipment – without, strictly speaking and effectively, the cause ('blame') for any of the situations being, however, attributed to them.

In short, railway telecommunications can be the direct cause of disruption to traffic regularity and quality of service, and may be indirectly the origin of safety violations or accidents, without however directly causing and being responsible for them. Any of the situations must be regarded as of the highest priority and responsibility, which means that support of communications directly related to traffic safety, and also to traffic control, is one of the most demanding tasks faced by railway telecommunications in the areas of design, implementation and maintenance, due to the impact they may have (and have effectively had) directly on quality of service, but also, albeit indirectly, on traffic safety itself. An accident always results from a succession of errors and failures; railway telecommunications must never provide or be one of these failures.

Every railway telecommunications system must strictly accomplish its objectives, be clear and easy to use, deliver high reliability and resilience. These are the qualities that made safety related railway telecommunications actually safe.

BIOGRAPHY

José Pestana Neves is an Electrical Engineer (Electronics and Telecommunications), and has worked continuously and exclusively, since 1969, in the subject of railway telecommunications. He is currently an Adviser to the Board of Directors of Refer Telecom and a Member of the UIC European Radio Implementation Group (ERIG).

FURTHER READING

José Pestana Neves is also the author of *'Railway Telecommunications – How, Why and What for' (Ed. Refer Telecom, Lisbon, 2012).* This book is available at www.refertelecom.pt.

PART TWO

Part two of José Pestana Neves' *'Railway telecommunications and traffic safety'* article will be published in ***European Railway Review Issue 1 2013.*** To guarantee you receive your copy, become a subscriber today by contacting Karen Hutchinson at khutchinson@russellpublishing.com or by visiting our website at www.europeanrailwayreview.com

MTU is preferred supplier for Hitachi Super Express trains

The Tognum subsidiary, MTU Friedrichshafen GmbH, is to supply Hitachi Rail Europe Ltd. with 250 Powerpacks with Series 1600 rail engines. Hitachi and MTU have also agreed a comprehensive maintenance contract for the drive plants to cover the service-life of the trains. The total value of the contracts to be completed exceeds €200 million.

At InnoTrans 2012, Alistair Dormer, Executive Chairman and CEO of Hitachi Rail Europe (left), and Dr. Michael Haidinger, Chief Sales Officer at Tognum (right), agreed to cooperate for the supply and maintenance of 250 MTU Powerpacks for the British Intercity Express Programme (IEP).

Credit: MTU

The Powerpacks are set to drive Hitachi's future high-speed Super Express trains which are scheduled to go into service from 2017 on the Great Western Main Line and East Coast Main Line routes as part of the British Intercity Express Programme. Delivery is scheduled between 2013 and 2018 and the maintenance contract is to run from 2017.

"At Tognum, we are proud that the outstanding reliability of our Powerpacks and our extensive experience with comprehensive maintenance contracts will allow us to be part of the Intercity Express Programme and partners of Hitachi," said Tognum Chief Sales Officer Dr. Michael Haidinger, at a joint press conference with Hitachi at InnoTrans 2012.

The MTU Powerpacks for the Hitachi railcars are diesel-electric underfloor drive units producing 700kW. At the heart of the package is the 12-cylinder MTU 12V 1600 R80L diesel engine. The unit meets EU Stage IIIB emissions regulations which came into force in 2012 and is fitted with an SCR exhaust gas after-treatment system. Along with the engine and generator, the Powerpack contains all the subsidiary assemblies needed to drive the vehicle. As well as purely electric vehicles, the Super Express train family includes bi-mode trains which operate solely on electricity where overhead lines are available but also run as diesel-electric units on non-electrified routes. The pure electric trains are also set to be fitted with one Powerpack each for auxiliary power. Depending on their length, bi-mode vehicles will each have three (five-unit trains), four (eight-unit trains) or five (nine-unit trains) Powerpacks. Prior to this recent announcement, Hitachi has already started intensive tests at their own facilities in Japan using a Powerpack prototype specially prepared by MTU for the joint project. The test programme focused on fuel consumption, noise and vibration, power and exhaust emissions.

MTU warranties the availability of the drive plants over the service-life of the trains. The comprehensive maintenance contract which accompanies the warranty covers preventive maintenance as well as repairs and major overhauls. In addition to its East Grinstead workshop which has been specially extended for the project, MTU is planning to station its own service personnel at rail depots in North Pole (London) and Doncaster (South Yorkshire). Engines for the current generation of British InterCity 125 high-speed trains were likewise supplied by MTU and the company also implemented a similar service concept covering preventive and corrective maintenance of the vehicles. Based at East Grinstead in West Sussex, MTU's British subsidiary MTU UK Ltd. is responsible the service programme.

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