CER

The Voice of European Railways

POSITION PAPER

Future Radio Communication system

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COMMUNITY OF EUROPEAN RAILWAY AND INFRASTRUCTURE COMPANIES - COMMUNAUTÉ EUROPÉENNE DU RAIL ET DES COMPAGNIES D'INFRASTRUCTURE - GEMEINSCHAFT DER EUROPÄISCHEN BAHNEN UND INFRASTRUKTURGESELLSCHAFTEN

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CER is welcoming the initiative of ERA in defining the next radio communication system for Railways. Many CER members supported this activity and sent their answers to the questionnaire on the operational requirements for radio communication systems.
We would like with this position paper to clarify the CER view on the method and the principles that we consider essential to follow.

Approach and method when defining the future radio communication system:

A special attention has to be paid to the following topics when choosing the relevant radio communication technology (either public or specific):

- Life expectancy of the railway radio communication system
- Economical assessment
- Obsolescence management
- Migration strategy

A top-down approach starting with the operational needs and users requirements should be undertaken. In order to achieve it, a review of experience on GSM-R as a data and voice medium must be conducted. In our opinion, this study should allow us to evaluate the benefit (or drawback) related to the fact that GSM-R was built from a standard widely used by service provider:

- Prices: GSM-R equipment (ground network) is derived from GSM equipment. Development costs of the GSM part are supposed to have been supported by the telecom industry, railway industry should have supported only the specific part of GSM-R. We consider that this was not the case and we are looking forward to an improved economical approach

- Obsolescence: GSM-R decision was taken during the 90's, when GSM equipment were deployed on a large scale by telecom service providers. 15 years later, GSM-R deployment is still on-going but telecom service providers are deploying the 4th generation of radiocommunication technology. GSM equipment is obsolete for years. GSM-R equipment will hardly be supported after 2025-2030 (less than current expectation of at least 10 years after the last deployment). Taking into account railway industry delays and life cycle (development of railway specific features, decision to deploy, deployment of ground network), it's not worth to rely on a standard developed for telecom service which has a much shorter life cycle

To better control prices and obsolescence, it could be interesting to learn about the costs and benefits of developing a specific solution, hopefully in cooperation with other mission critical sectors
Additionally, a trial has to be established based a complex and dense traffic configuration for the voice application considering degraded traffic conditions. This trial must be resistant to the traffic conditions including railway network with dense urban services..

We have listed below the main principles that we, CER, consider to be essential operational concepts to be retained while defining the future radio communication system. Globally, we believe that for the future communication system, operational features have to be specified more clearly prior to the definition of any technical solution.

Principle 1 : Robustness to interferences, especially for ETCS L2 and L3

The future radio communication system has to be resistant to interferences and it has to be future-proof to the introduction of any new technology in the adjacent bands. Coexistence has to be ensured in a changing spectrum environment. A impact assessment has to be conducted each time a new technology is introduced to ensure the railway system is not affected. Before authorization of modifications of public radio sites in the vicinity of railway lines equipped with Railway Radio Communication system, coordination with railway telecom operators must be conducted to identify potential impacts hindering the railway operations.

Principle 2: Access to public networks

Whatever the future radio communication system technology would be, access to the public network is a common necessary feature of Cabradio. This access is required either as a fall-back measure or as a mean of communication on secondary lines not equipped with the Railway Radio Communication System.

Principle 3: Improved radio functionalities for more efficient train operations:

We consider of utmost importance to have the following functions:

1. At border crossings, seamless transitions between two different national networks with transfer of Radio Emergency Calls to the adjacent network
2. Operationally-efficient radio emergency call limited to the necessary concerned trains..
3. Interoperable and improved location addressing abilities in order to address specific trains in complex railway networks (e.g. urban areas). In particular, independence between the cell design and the location-based mechanism is required.
4. As far as the standard is concerned, a clear separation of functional requirements and technical requirements is necessary.

Principle 4: Improved radio performance for more stringent traffic conditions

Performances need to be improved for more intensive traffic conditions: The GSM-R system is not able to meet the voice and data demands of the modern railway.
As far as voice communications are concerned, performance is to be improved with the future system, as it is insufficient for safe and uninterrupted operations in dense traffic areas.

1. More throughput and communication capacity along with less transmission delay are required for dense traffic areas and disrupted conditions of traffic
2. Quality of Service (QoS) and reliability requirements with a clear separation between the on-board objective and the network objective are necessary.
3. Call and REC set-up times are to be reduced

As far as ETCS L2/L3 is concerned, the QoS requirement has to be globally improved and the Subset 093 has to be revised. CBTC and ATO functionalities at least should be considered applications to define the radio system performance . Migration towards IP packet radio transmission seems to be a necessity both from a standard perspective and from a performance point of view. When migrating towards packet transmission, it will remove a capacity limitation. This will allow implementing a redundant radio connection from the EVC to the RBC and improving the system availability.

Principle 5: Remote monitoring of the performance of the network and supervision of the network elements. This principle is the key to guarantee a correct behaviour of the railway system. The radio system should carry such monitoring and supervision requirement.

Principle 6: Transmission of information on location of trains and on train direction. This operational feature is essential to an improved location-based addressing mechanism and REC transfer, but also to locate the place of an incident.

Principle 7: Additional functionality of the system should be provided with for example (to be refined):

- Text messages should be applied again with harmonized information to drivers on train running information
- Drivers able to respond to signaler messages without the train needing to stop Driver able to request trains ready to start
- Updates of software

Principle 8: Train to ground voice communication recording facility

The future radio communication system technology shall allow an easy and centralized implementation of voice recording functionality: in particular this facility shall allow to record specific voice communication based on user-categories, such as communication between drivers and controllers, through a call interception and recording function to be implemented at Network Switching System level (functionality available on GSM-R networks).

Besides those principles, we consider that the authorization procedure has to be simplified and supported by a comprehensive set of test cases in order to reduce the authorization delays. A formal method approach from the specification to the verification/production of test cases is highly recommended.

The specification of the future system shall have a clear distinction between mandatory requirements and optional requirements, as for ETCS. CER fears that the current distinction between and M and MI requirements can lead to inconsistency between deployments on trackside and onboard as far as there is no legal obligation in Europe to fulfill the M requirements. In some cases M requirements could be considered implicitly as National Rules.

Disclaimer

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