VoLTE Performance in Railway Scenarios: Investigating VoLTE as a Viable Replacement for GSM-R

GSM-Railways (GSM-R) is the current standard for railway voice and data communication. GSM-R provides railway specific voice services, such as Railway Emergency Call (REC). GSM-R provides also the European Train Control System (ETCS), which offers in-cab signaling and Automatic Train Protection (ATP). Despite these features and services, GSM-R has various major shortcomings. Therefore, alternative technologies are considered to replace GSM-R and become the next generation railway mobile communication network. 3GPP Long Term Evolution (LTE) is a likely candidate for GSM-R replacement. LTE is more efficient, flexible and offers much higher capacity, which allows the railway network to provide new communication-based applications for railways. Most of the research on LTE in railways has been focused on data-based railway applications (ETCS signaling and other). Nevertheless, voice communication is still a crucial service for railways. Regardless of its advantages, LTE can only become a railway communication technology if it provides voice communication fulfilling railway requirements. This paper presents how Voice over LTE (VoLTE) can be used to build railway communication services. Examples of Railway Emergency Call and One-to-One Call are provided. Service performance, in terms of call setup times and voice transmission quality, is analyzed in simulation scenarios modelling two railway scenarios in Denmark.

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