Capacity gain with an alternative LTE railway communication network

GSM - Railways (GSM - R) is the first international communication network designed specifically for railways. Most of the deployed GSM - R networks were initially used only to provide the railway voice communication. However, as more of these GSM - R networks begin to support the European Train Control System (ETCS) signaling, the capacity of GSM - R turns out to be insufficient. GSM - R cannot fulfill the railway requirements, in terms of the number of simultaneous ETCS connections. This is why, alternative, more efficient communication technologies should be considered by railways, such as 3GPP Long Term Evolution (LTE). This paper describes how to adapt the reversible multi-chain/channel queuing system to model an LTE cell serving ETCS-equipped trains. It is proposed to use the multiple user chains available in the model to represent varying bitrate in LTE radio access network. Using this model, LTE and GSM - R are compared in terms of capacity on an example at Copenhagen Main Train Station. The purpose of this work is to demonstrate the benefits that railway operators and infrastructure managers can expect from the introduction of LTE, as a telecommunication technology for railway control signaling and additional applications.

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