A multi-radio, multi-hop ad-hoc radio communication network for Communications-Based Train Control (CBTC) - DTU Orbit (23/11/2018)

A multi-radio, multi-hop ad-hoc radio communication network for Communications-Based Train Control (CBTC)

Communications-Based Train Control (CBTC) is a modern signalling system that uses radio communication to transfer train control information between train and wayside. The trackside networks in these systems are mostly based on conventional infrastructure Wi-Fi (IEEE 802.11). It means a train has to continuously associate (i.e. perform handshake) with the trackside Wi-Fi Access Points (AP) as it moves, which incurs communication delays. Additionally, these APs are connected to the wayside infrastructure via optical fiber cables that incurs huge costs. This paper presents a novel design in which trackside nodes function in ad-hoc Wi-Fi mode, which means no association has to be performed with them prior to transmitting. A node upon receiving packets from a train forwards these packets to the next node, forming a chain of nodes. Following this chain, packets arrive at the destination. To make the design resilient against interference and failures, transmissions are separated on multiple frequencies and a node forwards packets to not only one but two of its neighbors. This paper investigates the resiliency, redundancy and scalability performance of this design and presents the results both from a field experiment involving prototype hardware and an extensive simulation study.

General information
State: Published
Organisations: Department of Photonics Engineering, Networks Technology and Service Platforms, nyantec UG, Siemens A/S
Contributors: Farooq, J., Bro, L., Karstensen, R. T., Soler, J.
Number of pages: 7
Publication date: 2018

Host publication information
Title of host publication: Proceedings of IEEE Vehicular Technology Conference-Fall 2017
Publisher: IEEE
Keywords: Railway signalling, CBTC, Radio communication, Wi-Fi, IEEE 802.11, ad-hoc, Multi-radio, Multi-hop
Electronic versions:
PID1196130_v5_on_author_account.pdf
DOIs: 10.1109/VTCFall.2017.8288281
Research output: Research - peer-review › Article in proceedings – Annual report year: 2017