Fast rAdio technologieS for uninterrupTed TRAin to traCKside communicationS

Rapports

Informations projet

FAST-TRACKS

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Periodic Reporting for period 2 - FAST-TRACKS (Fast rAdio technologieS for uninterrupTed TRAin to traCKside communicationS)

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Résumé du contexte et des objectifs généraux du projet

Mainline and urban railway networks play a pivotal role in the economic growth of a country. High urbanisation rates in metropolitan areas have increased the demand for high-capacity rail infrastructures, which require an efficient interoperability among several systems and services; that calls for high standards of safety and reliability.
In turn, rail systems and services call for a high level of innovation in the telecommunications, and automation and control fields. In recent years, the technological progress has resulted in the development of systems for automatic train protection, operations and control that make use of different telecommunications standards and technologies.
In recent years, traditional wireless networks have been playing a key role in supporting railway signalling systems. They run alongside the railway infrastructure and provide voice and data services for train control and operations, as well as emergency communications, video surveillance and protection, multimedia services and also passenger connectivity. However, the coverage of such wireless networks seems to be not efficient. That is either because they are not specifically developed for the railway infrastructure, or because they cannot be adapted to keep up pace with the dynamics, or meet the mobility requirements, of railway infrastructures. Therefore, train operators need to put in place broadband telecommunications networks, through heterogeneous technologies, whether fixed or wireless. Heterogeneity of these networks is becoming a real headache for train operators and infrastructure managers: WI-FI, GSM-R, Satellite, 3G / 4G networks.
FAST-TRACKS project proposes the development and commercialization of a low cost telecommunication system, which addresses the main problems faced at present in the integration of a traditional Wi-Fi system within the railway technological infrastructure. The project aims at covering a functional gap in the railway radio telecommunication infrastructure. The project is based on the design of a reprogrammable radio supporting different Wi-Fi, Cellular and LTE standards at the same time, which will foster and guarantee the convergence between automatic train control systems and network telecommunication standards.
The main advantages of the multi-transport radio proposed are based on two pillars:
• high adaptability of the radio to the continuous evolution of wireless standards and cellular technologies;
• development of an innovative and not yet on the market product.
The proposed infrastructure, due to high-speed capacity, dual embedded radio and configurable approach, permits to integrate vital and non-vital services on the same wireless backbone simply dedicating different radio to different services operating with a full redundant architecture.

Travail effectué depuis le début du projet jusqu'à la fin de la période considérée dans le rapport et principaux résultats atteints jusqu'à présent

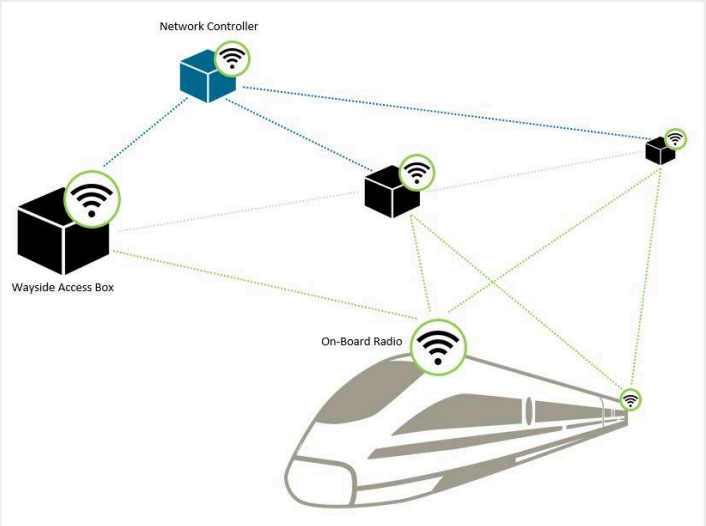
During the first period, starting from the analysis of the prototype developed during the first phase of the project (SME phase 1), project team completed the overall technical tasks related to the design of the hardware firmware and software of the onboard and wayside radio, wireless controller and the Wi-Fi antenna. In details, for each component of the FAST-TRACKS architecture, the team has completed the technical feasibility study, the requirement analysis, the selection of the hardware and

the customization of the firmware for both wayside and onboard radio.
At the same time, the project team has started the first communication and dissemination activities and the first activities related to the large-scale production process of both onboard and wayside radio.
During the second reporting period, starting from the final prototypes of the FAST-TRACKS for both wayside radio as well as onboard radio, project team completed the activities related to the large-scale production process of both onboard and wayside radio. Also, the certification process of both radios was completed successfully.
As programmed, the first set of FAST-TRACKS radio was produced (20 Access Points), useful to start the indoor testing phase (laboratory) and the outdoor, on a concrete railway scenario. As a result, the first FAST-TRACKS certified series for both wayside radio as well as onboard radio were developed.
At the same time, the project team has continued the communication and dissemination activities and completed the filing of an additional patent, opening the FAST-TRACKS radio to a new disruptive innovation: the Li-Fi (Light-Fidelity) an innovative technology useful to transmit data over visible light.

Progrès au-delà de l'état des connaissances et impact potentiel prévu (y compris l'impact socio-économique et les conséquences sociétales plus larges du projet jusqu'à présent)

The wireless coverage of the existing railway technological infrastructure does not ensure operation standards, capacity and robustness required for a large-scale use in support of the railway signaling. The existing solutions on the market are "general purpose" solutions or solutions designed to function only indoor or outdoor and only with static architecture, which do not respond to the needs of mobility and the dynamics of a complex rail system. For example, traditional systems work exclusively on 2.4 and 5.8 GHZ ISM band. This prevents the safe use of the devices in railway environments, where the level of interference is high. These systems also do not integrate LTE technology, a system of radio propagation universally recognized that represents the future of railway telecommunications. Given the heterogeneity of the railway (tunnels, bridges, open air), it is often impossible to integrate the same technology on the whole line.
The development of wireless communication systems for the railway sector requires wireless networks managed intelligently, using robust protocols, designed for the combined management of railway signaling, the automatic train control and data transfer. FAST-TRACKS therefore proposes a low cost system, which allows to address the major issues currently faced in the integration of a traditional Wi-Fi within the railway technological infrastructure. The ambition behind this project is to propose a single radio product, multiservice, able to cover the above mentioned needs and to perform better in a railway scenario.
The FAST-TRACKS radio is an on-board reprogrammable radio that supports Wi-Fi, LoRa and LTE standards.
Among the main benefits deriving from the exploitation of the FAST-TRACKS system for the target users are the following:
• Improved safety: Trains are automatically prevented from going too fast or getting too close to another train;

• Improved performance: Trains are able to run at their optimum safe speed at all times;
• Reduced running costs: There is less lineside equipment and hence less to maintain;
• Improved reliability: Modern technology, which is resilient and easy to update.
The first target market to be served by FAST-TRACKS is represented by the following industries: high-speed trains, lightrail systems, subways and metro, trams, freight railroads.



FAST-TRACKS: Train-to-trackside communications

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