

## **4.2.5 S2R-OC-IP2-02-2020 – Study on alternative bearers and on communication protocols**

### **SPECIFIC CHALLENGE**

The objective of the call is to investigate alternative communication means and solutions, which can be used in addition or for complementing the current standards for specific needs and/or for being implemented in well-defined and restricted areas. The objective is to improve the system adaptability in view of the application of full bearer independency defined in the framework of TD2.1. The action shall also address a study for identifying the best use the current communication protocols in view of streamlining the application according to the needs.

### **SCOPE**

The aim of the work is to assess two studies that complement the main stream work in the field of alternative communication bearers and of communication protocols. The study on alternative communication bearers in the railway environment shall identify, assess and analyze alternative bearers in addition and beyond established radio technologies (UMTS/HSPA, LTE, LTE-A, Wi-Fi/802.11, SatCom, etc.). The availability of the alternative bearers might be restricted to certain areas (for example train stations, shunting yards, high-speed lines, different terrains, etc.), related to specific railway infrastructure installations or ubiquitously available. The alternative bearers could rely on or leverage already available infrastructure or equipment alongside the railway tracks. Some potential candidates include but are not limited to data over power lines, free space optical communications, etc.

In order to address the challenges described above, proposals should address all the following work streams, in line with the S2R MAAP:

Work-stream 1: For what concerns the study of the communication bearers the action shall:

- a. Describe the alternative bearers from a technology perspective;
- b. Qualify the benefits and challenges of the bearers, taking into account operational and economic considerations;
- c. Outline the dependencies to infrastructure or other environmental preconditions;
- d. Compare the expected communication characteristics with well-established wireless technologies in terms of (but not limited to) average/maximum/guaranteed throughput, packet delay, packet jitter and other attributes such as Quality of Service support, resource management, multi-user / multi-application capabilities;
- e. Provide a recommendation or classification of bearers related to certain railway environments and further work in terms of technology and business case development.

Work-stream 2: For what concerns the study of the communication protocols the action shall:

- a. With the convergence of network protocol layer towards the Internet Protocols to identify the appropriate transport protocol for ensuring communication characteristics and capabilities during application development;
- b. Analyse interworking between Internet Protocol v4 and Internet Protocol v6;
- c. Analyse the different options for the transport layer (UDP, TCP, SCTP , etc.) and the application layer protocols (HTTP, QUIC, SIP, etc.) with the aim to narrow the selection for certain application requirements, qualifying the protocols in terms of technology features like flexibility, latency and prioritization as well as operational considerations including engineering and implementation complexity, monitoring and debugging capabilities;
- d. Analyse the security of the transport and application layer with using the secure version of protocols, e.g. SFTP or SCP instead of FTP, or HTTPS instead of HTTP or combining the protocols with application security.

An indicative scheduling of the deliverables is suggested below<sup>54</sup>:

- Deliverable (e) corresponding to work stream 1 is expected by month M12
- Deliverables a, b, c, d under work-stream 2 are expected at the latest by month M18

The S2R Joint Undertaking considers that proposals with a duration of 30 months would allow this topic to be addressed appropriately. Nevertheless this does not preclude submission and selection of proposals with another duration.

## **COMPLEMENTARITY**

As specified in section 2.3.1 of AWP 2020 in order to facilitate the contribution to the achievement of the S2R JU objectives, the options regarding 'complementary grants' of the S2R JU Model Grant Agreement and the provisions therein, including with regard to additional access rights to background and results for the purposes of the complementary grant(s), will be enabled in the corresponding S2R JU Grant Agreements.

The action that is expected to be funded under this topic will be complementary to the actions that are expected to be funded under the following topics:

- S2R-CFM-IP2-01-2020: Completion of activities for Adaptable Communication, Moving Block, Fail safe Train Localisation (including satellite), Zero on site Testing, Formal Methods and Cyber Security

The action stemming from this topic will also be complementary to actions carried out within the following project:

- X2RAIL-3 (GA 826141)

## **SPECIFIC CONDITIONS FOR PARTICIPATION**

In accordance with Art. 9(3)(d) of the HORIZON 2020 Rules for Participation, in this specific topic the minimum condition shall be the participation of one legal entity established in a Member State or Associated Country. The reason of this approach is justified by the technically specific nature of the expected activity that would not require a significant amount of investigation and cooperation.

## **EXPECTED IMPACT**

- The identification and analysis of new alternative communication bearers is expected to support the goals of the adaptable communication system (TD2.1) enabling new communication services for implementing future railway requirements. This will help reducing (estimated 50%) lifecycle costs.
- Increased possibility of bearers to be used by the new communication system therefore increasing operational flexibility.

---

<sup>54</sup> The scheduling of the deliverables is provided to facilitate the complementarity with the CFM actions and it is not binding. Additionally, each deliverable may have some flexibility in the scheduling

**Type of Action: Research and Innovation Action (RIA), TRL up to 4/5**