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Département d'Informatique



## REPORT ON RESEARCH ACTIVITIES

Internship at the Software Technology Laboratory,  
Department of Information and Engineering,  
University of Florence, Italy

From June 10 to July 09, 2019

- **PhD student:** Siham BOUCHELAGHEM
- **Year of study:** 3<sup>rd</sup> year
- **Thesis title:** Security and Privacy in Smart Cities
- **PhD supervisor:** Dr Mawloud OMAR

## 1 Context

Railway transportation systems have evolved considerably in the last years with the adoption of new communication technologies. Although safety is one of the most critical issues to be addressed in the railway context, availability is a primary requirement which should be taken into account in the design of new safety protocols for modern railway systems.

## 2 Goals

In this context, the aim of this internship at the Software Technology Laboratory is to extend my research works on security issues of Intelligent Transportation Systems to Quality of Service issues in rail transport. From this objective emerges two major guidelines, namely:

- (1) Investigating a novel manner to model railway networks considering multiple safety and reliability criteria;
- (2) Identify avenues of solutions that could lead to the proposal of a new mechanism for rail transport systems, which provides a trade-off between safety and availability.

### 3 Completed work

At the beginning of my stay, I have discussed the progress of my research works with Prof. Alessandro Fantechi. During this first exchange, we have identified some areas of research and potential issues to be addressed in the context of railway networks. Prof. Fantechi also gave me an insight on the different research projects that are carried out by members of the laboratory. During my stay at the Software Technology Lab, I have performed the following tasks:

- (1) Presentation of my previous research works during a seminar held at Santa Marta, University of Florence.
- (2) Familiarization with fundamental concepts of railway networks and the international signalling system standard ERTMS/ETCS;
- (3) Discussions about new safety mechanisms adapted to the ERTMS/ETCS standard, which take into account the constraint of Quality of Service.
- (4) Meeting with Dr. Laura Carnevali to discuss about a project she is carrying in the area of performability evaluation of railway signalling systems.
- (5) Attendance to courses on « Vehicular Networking: Applications, Architectures and Challenges » given for PhD students of the doctorate school of Information Engineering, at Santa Marta, University of Florence.

### 4 Results

During this internship, I have investigated safety and availability issues in rail transportation systems and analyzed the work done relating to this topic. A new line of research was discussed with Prof. Fantechi during several working sessions and very interesting prospects were identified. My presence at the laboratory allowed me to benefit from the experience of its members and to have an overview on novel areas of research both scientifically and technologically.

Student signature  
Siham Bouchelaghem



Florence, 09/07/2019  
Seal of the host laboratory  
Prof. Alessandro Fantechi

