Abstract

Monitoring people afoot as well as vehicles has become crucial, not only for safety but also for several practical business applications, facility management, and services. In relation to that, the proliferation of IoT-based services and the growing industry of telecommunications are playing a vital role in providing the perfect ecosystem for advanced smart city use cases. Numerous research and studies supported by the private sector are addressing the various use cases for mobility tracking and safety services. The purpose of this work is to make contributions to the mobility tracking and safety services of smart cities with the help of IoT devices and telecommunication infrastructures. Hence, IoT based WiFi sensors and MEC based virtual sensors were used for mobility tracking and safety systems in our work.

The WiFi sensor devices detect the presence of people from the WiFi signals, the WiFi probe request frames of smartphones. We have considered two types of devices, namely, commercial, off-the-shelf WiFi scanners and ad-hoc designed WiFi scanners implemented with Raspberry PIs. They provide different levels of visibility of the captured traffic. The detected probe request packets contain the associated MAC address of the transmitting device. Since the MAC address is considered personal data by the EU GDPR, a privacy protection mechanism was required for tracking people's movements. Although the currently available technologies have made efforts through anonymization techniques, the privacy concern remains vulnerable for MAC addresses. Thus, we have implemented a privacy-preserving scheme for addressing the privacy challenge and tackled the problem of identifying people's movement for the popular mobility patterns in an urban environment by using WiFi sensors connected to the cellular network. Furthermore, events and group activities were captured with the support of a model. We illustrate our approach and present results derived from live measurements in a testbed deployed in the city of Turin

within the 5G-EVE project.

On the other hand, we have implemented a MEC-based EVS safety service, in particular collision detection on intersections for vehicles and pedestrians. The system leverages the mobile network, collecting mobility data (i.e., position, velocity, acceleration, etc.) periodically from smartphones and onboard units of vehicles in order to have awareness about the monitored area. The EVS system is capable of detecting collisions ahead by computing the future trajectories of all the vehicles and pedestrians in a given geographical area. When imminent collisions are detected, warning messages are sent to the regarding entities before the impact, so collisions can be avoided. Furthermore, in the work, traffic flow scenarios were modeled for an urban environment. The testbed of the system was carried out on the OAI standard platform. Finally, we present the evaluated performance of the mobility safety system.