INSURE - Information Security of Location Estimation and Navigation Applications

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Abstract—Positioning and navigation technologies include satellite-based systems, i.e. Global Navigation Satellite Systems (GNSS), as well as non-GNSS techniques for determining the position of a person or an object of interest. Localization solutions on mobile devices are becoming a reality and they will open the gate towards the future personalized Location Based Services and towards enhanced public safety solutions. Many navigation systems are also capable of providing precision timing. Such systems are increasingly being used in safety- and/or security-critical applications such as aviation, autonomous vehicles, and emergency services, as well as synchronization within communication systems, financial infrastructures, power grids, etc. This makes navigation technologies not only an obvious target for malicious attacks but also a critical point-of-failure in case of unintentional disruption. The growth in vulnerabilities has far outpaced the spread in public and authorities awareness, as well as development of mitigation techniques. In short, the security and privacy aspects of positioning and timing technologies have been scarcely addressed. Secure positioning solutions involve not only the physical layer, where robust and trustable solutions need to be devised under a variety of scenarios (such as intentional attacks, unintentional interferences due to spectrum crowdedness, deteriorations and false entries in the location databases), but also the upper layers where security protocols for positioning need to be designed and algorithms to validate the anonymous reputation and to determine the trust level of the players involved in the localization flow are needed. Our INSURE project, to be presented as a poster, is to to create (1) beyond state-of-the-art knowledge for improving robustness of GNSS receivers against jamming and spoofing, (2) advanced methods for improving user privacy and information security in non-GNSS positioning, and (3) legislative solutions in terms of policy and regulatory recommendations for improving the privacy of end-user data exchanged in location-based services. This project integrates the expertise of four research groups within Finland, resulting in a transdisciplinary consortium. The combined expertise areas include positioning and navigation technologies, sensor fusion, statistical analysis, communication and automation engineering, cryptography, and information law. The core partners in the consortium are the Finnish Geospatial Research Institute, Tampere University of Technology (two departments involved), and University of Helsinki, supported by a number of complementary collaborators and industry partners from the EU and the USA, each at the leading edge of research in their respective technology domains. The project, meant for two years, started on 1st of September 2016. The successful implementation of the project is expected to positively impact novel technology and algorithm development, its commercialization potential, its influence on future regulations, and its significance in shaping the public perception about secure, privacy-strengthened, and robust location-based applications and services. This research work will complement Finlands existing position as a front-runner in location-based ecosystems. The poster will present the project structure, the project main assumptions and a three-layer localization model which is the basis of our studies. It is expected that its research topics will attract the attention of the conference audience for future potential collaborations and interractions.