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**Master Thesis Defense**

Entitled

*FAST AND RELIABLE AUTHENTICATION METHOD FOR INDOOR CONSTRAINED DRONES*

by

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Abstract

Over the last twenty years, the commercial sector of Unmanned Aerial Vehicles has been growing exponentially, owing to their rapid deployment, high mobility, and the number of applications in the industry field such as military, transportation, critical infrastructures, as well as in the academic field for research purposes. One of the main communication systems adopted by the UAVs relies on transmitting wireless signals.

In particular, UAVs are adopted for indoor use-case scenarios, such as warehouse inventory applications and indoor building inspections. They need to transmit control messages and sensitive data by leveraging an efficient, short-range, and secure communication channel to avoid man-in-the-middle, spoofing, and hijacking attacks. This dissertation focused on investigating the security of very constrained unmanned aerial systems in IEEE 802.15.4 networks targeted for indoor domains.

In this thesis, we propose a new secure protocol based on Bitwise Precomputable Message Authentication Code (BP-MAC) scheme to provide authenticity and integrity protection to the message payload. Further, we propose also a new protocol that can be encapsulated in the MAC layer of IEEE 802.15.4 networks to improve drone accountability in indoor scenarios. Combining the use of the BP-MAC scheme and our protocol for UAVs in indoor scenarios results in several benefits in terms of optimization, efficiency, and a reduction in the amount of exchanged data. We provide the results by simulating our proposed solution from the computational and networking perspective. The proposed solution is filling the security gap in the literature (e.g, UMAC) to effectively safeguard the communication of indoor drones. It demonstrates a significant improvement in terms of memory usage, bandwidth, energy savings due to reduced workload, and the ability to attain the same level of security offered by traditional authentication schemes by using lighter techniques. Within this work, we identify and address new security challenges for the future promising research directions.

**Keywords:** Bitwise Precomputable MAC, BP-MAC, indoor environment, UAVs, drones, fast authentication, privacy, secure communication.