Zero-Watermarking Approach for Data Integrity and Secure Provenance in IoT Networks

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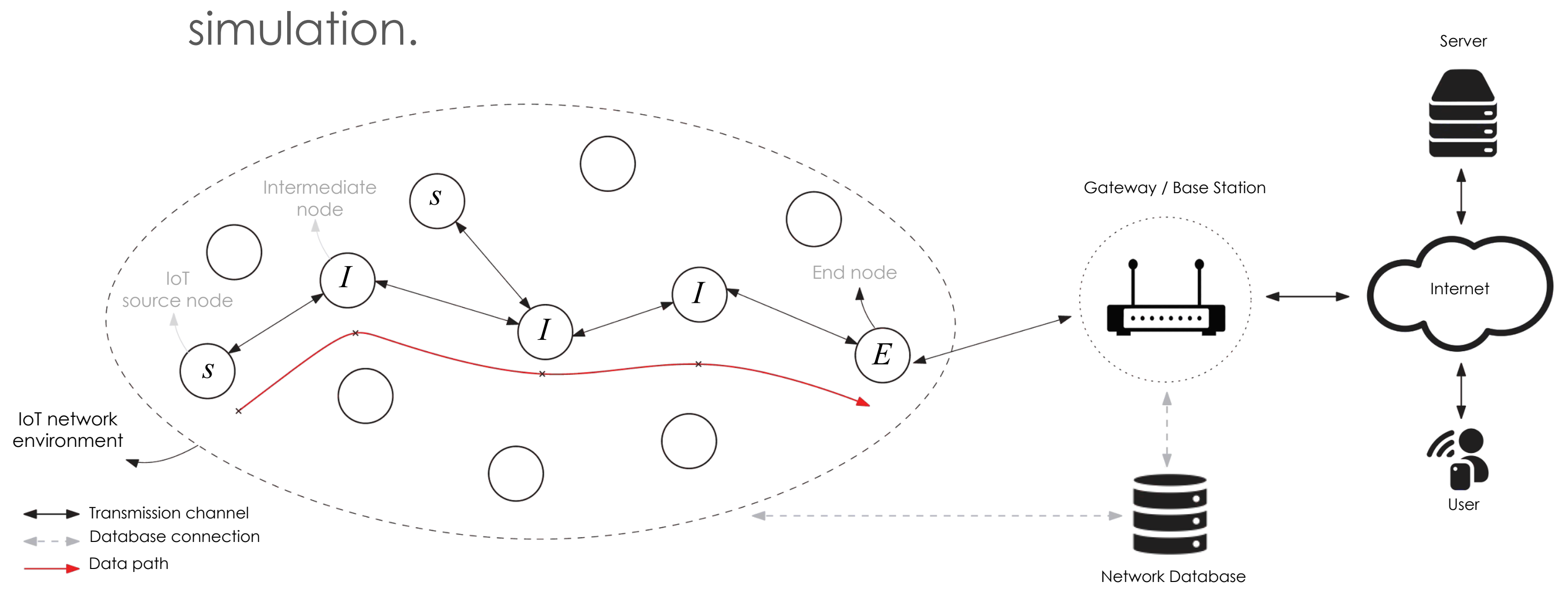
Motivation

1. IoT is integrating smart devices in almost every domain such as home automation, e-healthcare systems, vehicular networks, industrial control and military applications.
2. Sensory data, which is collected from multiple sources and managed through intermediate processing by multiple nodes, is used for the decision-making processes.
3. Ensuring data integrity and keeping track of data provenance is a core requirement in such a highly dynamic context (e.g., for the assurance of data trustworthiness).

Data provenance allows tracing the source and forwarding the path of an individual data packet. Provenance data must be recorded for each packet, but essential challenges arise due to the tight storage, energy and bandwidth constraints of sensor nodes.

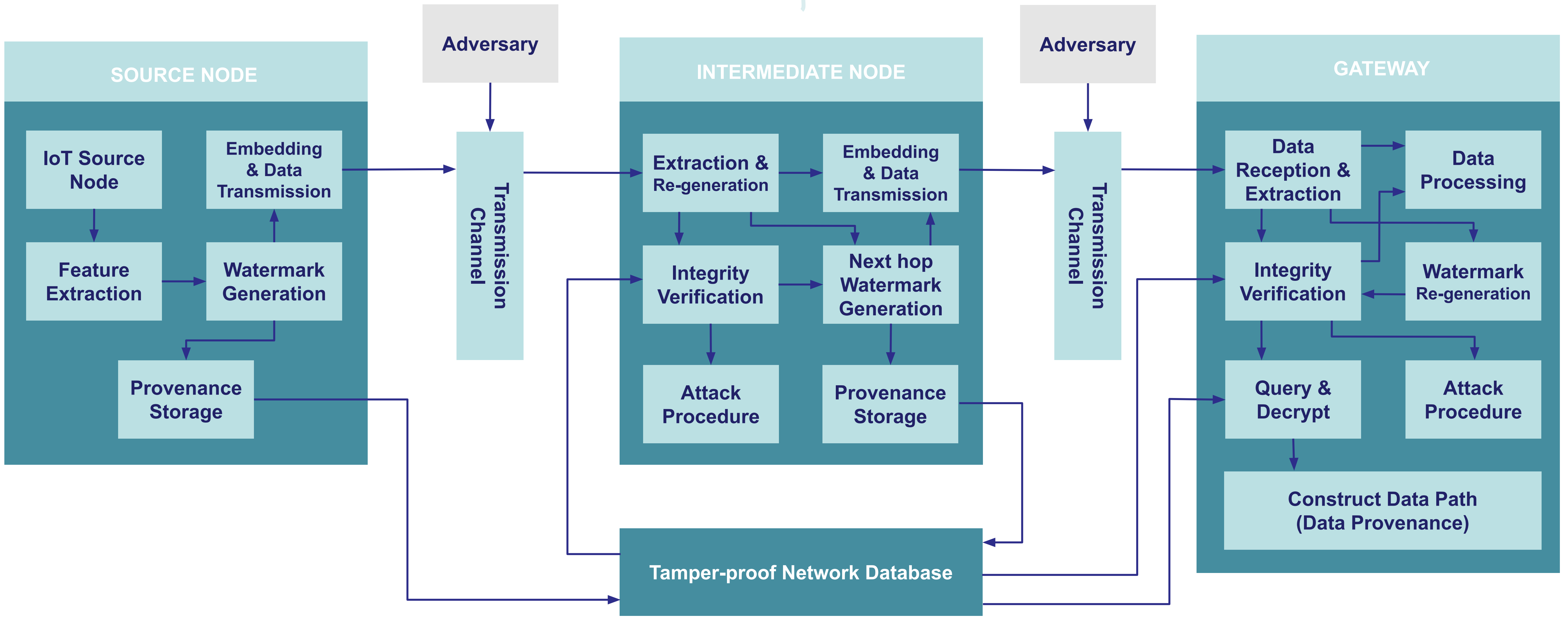
Objectives

1. Propose a scheme for smart home IoT networks to ensure data integrity in single- and multi-hop scenarios.
2. Handle secure provenance transmission using a zero-watermarking approach with a tamper-proof network database.
3. Two main adversary models: passive and external adversaries.
4. Evaluate the performance of the final solution via simulation.



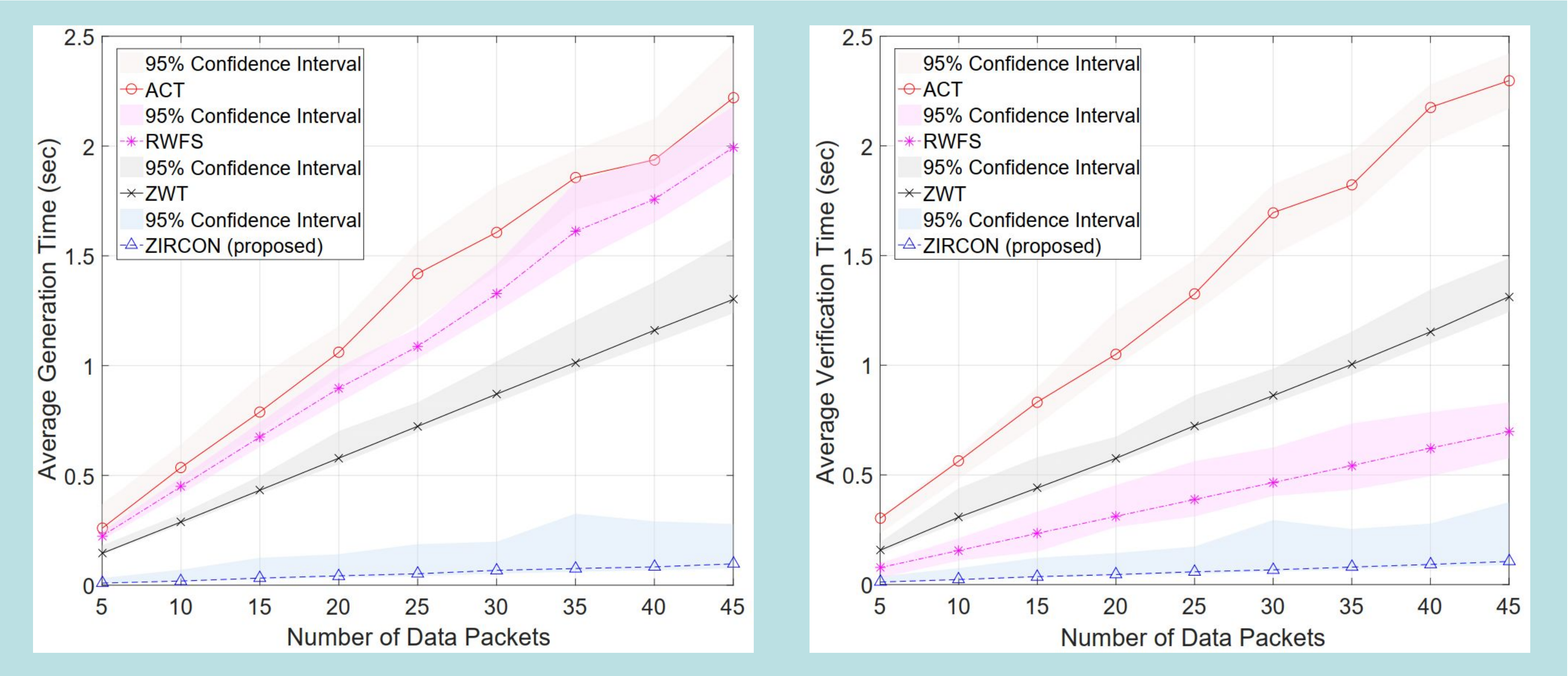
Proposed Approach

ZIRCON – Zero-watermarkIng based data pRovenanCe for iOt Networks

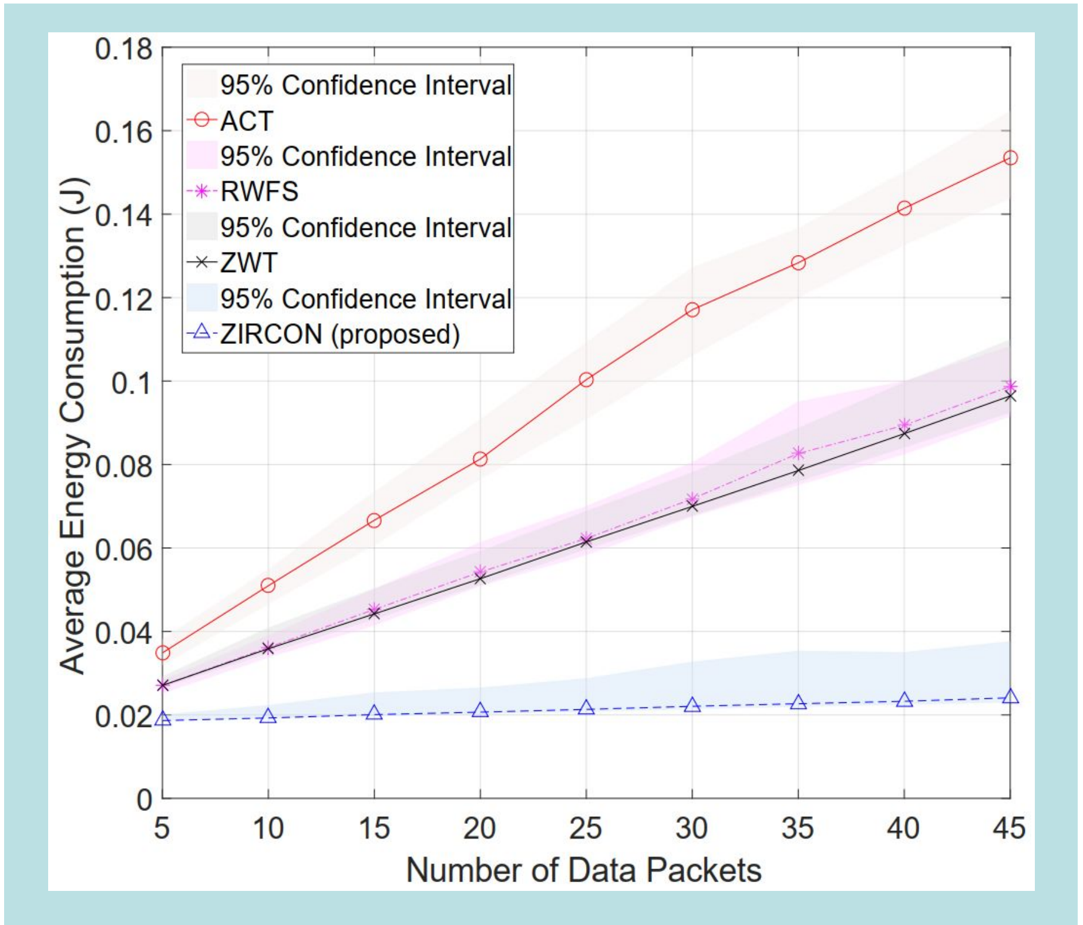


Performance results

Watermark Generation and Verification Time



Energy Consumption



Samovar PhD Day

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Publications

- Faraj, Megías, Ahmad, Garcia-Alfaro. "Taxonomy and Challenges in Machine Learning-based Approaches to Detect Attacks on the Internet of Things". 7th International Workshop on Security and Forensics of IoT, 15th International Conference on Availability, Reliability and Security (IoT-SECFOR/ARES).

- Faraj, Megías, Garcia-Alfaro. "ZIRCON – Zero-watermarking based data provenance for IoT Networks", IoT journal, under evaluation.

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