STUN: Secret-Free Trust-Establishment For Underground Wireless Networks

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Background and Objective

- Ag-IoT is increasing the efficiency of farming by increasing the quality and quantity of crop yields.
- The real-time data collected from the underground sensors must be securely transferred to the gateway (destination).
- **Our objective** is to design and implement a protocol to ensure the **secure transmission and reception of sensitive data.**

Fig 1: Underground nodes securely communicating with gateway.

Model and Preliminaries

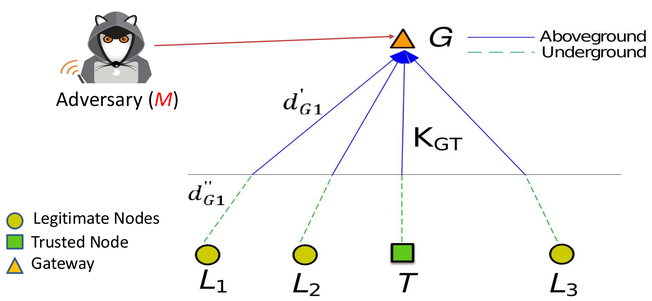


Fig 2: System Model

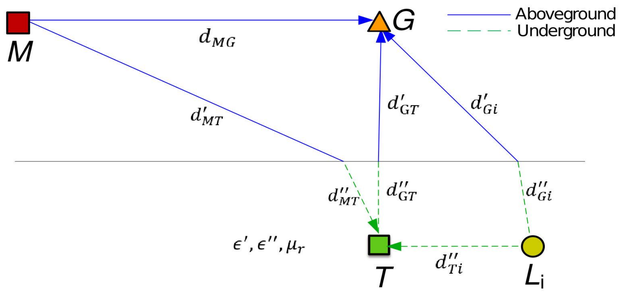


Fig 3: Type 1 Adversary

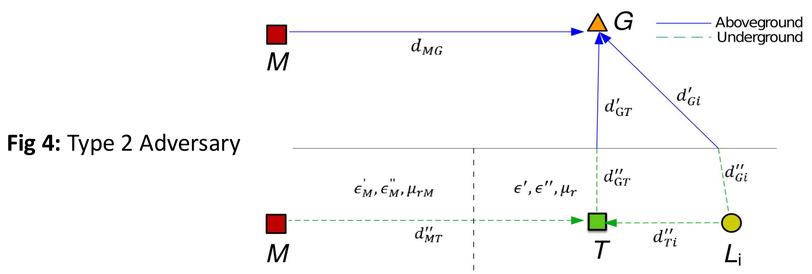
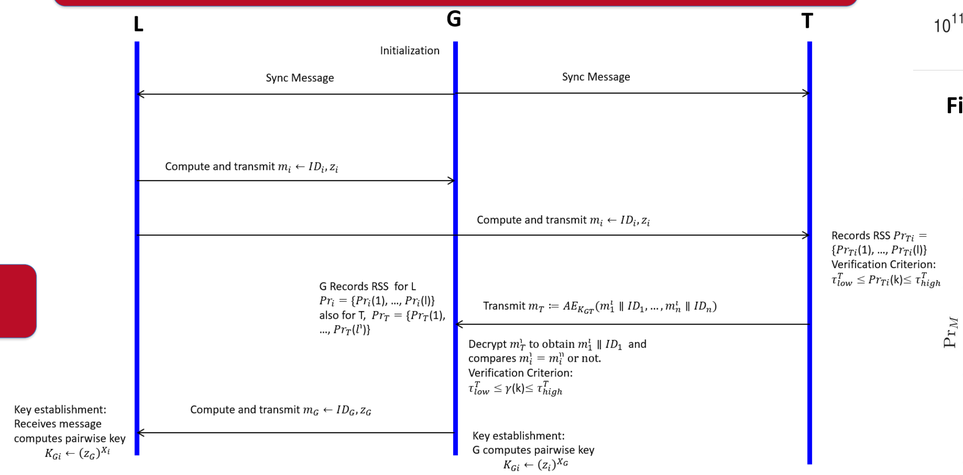
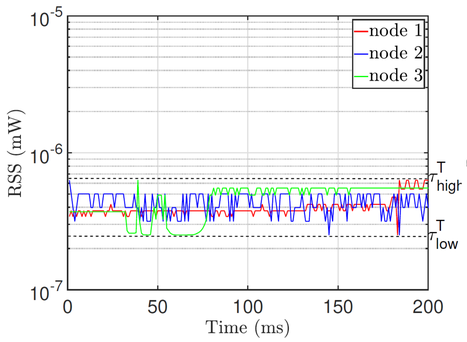


Fig 4: Type 2 Adversary

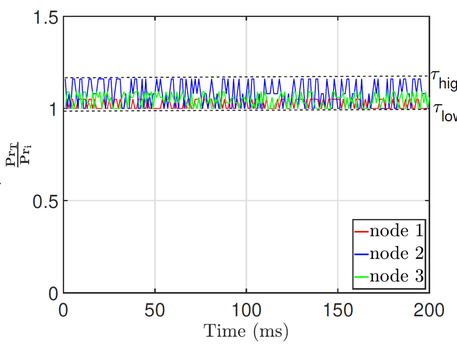
STUN: Trust Establishment Protocol



Selection of Threshold



Threshold at *T*



Threshold at *G*

Fig 5: STUN Thresholds

Experimental Results

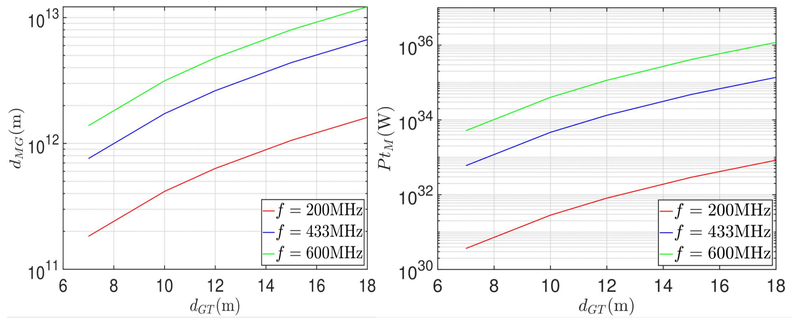


Fig 6: Prohibiting high power required to defeat STUN by Type 1 Adversary

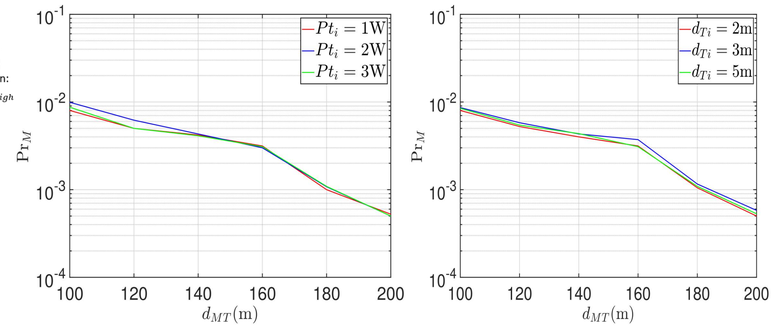


Fig 7: Extremely low success probability of Type 2 Adversary in defeating STUN

Conclusions and Future Work

- We Proposed secret-free STUN for COTS underground node Over-the-Air gateway. The security is equivalent to Unbalanced Oil & Vinegar scheme
- Used hard-forge underground wireless propagation laws for secure bootstrapping.
- Placement of multiple trusted Nodes to cover an entire Farm– **In progress**

References

1. Silva, Agnelo R., and Mehmet C. Vuran. "Development of a testbed for wireless underground sensor networks." *EURASIP Journal on Wireless Communications and Networking* 2010 (2010): 1-14.