Research Internship / Master Thesis:

Time Synchronization in Wireless Networks

Context

IoT devices have gained lots of popularity over the last years and were deployed in many different applications. One strength of these devices is the connectivity and interoperability which allows to build very large and complex networks by relying on widely adopted protocols such as IP and TCP/UDP. In order to use IoT devices and the inherent packet-based communication in real-time applications, however, additional preconditions need to be fulfilled. One challenge is the reliable and precise time synchronization among all participating nodes inside the network which is a critical requirement in many control and automation tasks, for example. In order to preserve the flexibility of the IoT devices, the synchronization should not depend on the used physical communication layer. In particular, a device should achieve comparable synchronization results using any wireless channel (e.g., Wi-Fi or 5G) instead of the traditional wired networks.

In this work, the student should get familiar with the task of network time synchronization and focus on the synchronization via wireless channels. The theoretical analysis should be complemented with a small proof-of-concept implementation to evaluate the performance (e.g., the achieved precision level). *Note: All tasks in this work can also be approached from a security perspective if desired but this is not a requirement.*

Tasks

1. Get familiar with time synchronization protocols, specifically with PTP.
2. Learn about the requirements to the wireless channel (and related hardware) including potential obstacles and pitfalls for reliable and precise time synchronization.
3. Setup a test environment to conduct performance tests.

Requirements

- Good programming skills (preferably C/C++, Python)
- Basic knowledge in security
- Experience in real-time systems is beneficial

The topic could be targeted in either a research internship or a master thesis, however, the latter is preferred.

Contact

If you are interested in this position, please send your full application (CV, transcript of records, possible start dates) to Andreas Finkenzeller (**andreas.finkenzeller@tum.de**).

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