OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG | INF | FAKULTÄT FÜR INFORMATIK

Communication and Networked Systems

CHAIR OF COMMUNICATION AND NETWORKED SYSTEMS (COMSYS)

# (Master Thesis Offer)

## Topic: Time Synchronized MAC Protocol for the Internet of Things (IoT)

**Duration:** 180 hours
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## Introduction

A growing number of smart objects are being connected to the Internet to making the world a smart place leading to the emerging concept of Internet of Things (IoT) [1]. IoT applications range from simple home applications to medical health care, smart grids, and industrial monitoring and control [1]. Several challenges are faced by IoT in a similar way as the internet faced during its inception. These challenges exist in different layers of the OSI protocol stack starting from PHY layer to Application layer.

IoT is a heterogenous environment, all the aforementioned applications of IoT will co-exist with each other and will generate different kinds of traffic, some of the traffic is more critical (high priority) than the other (normal), for exmaple in medical health care applications emergency traffic is always treated on priority than normal traffic. Therefore, networking infrastructures should take appropriate measures to transmit the emergency traffic with reliability, low latency, and as well energy efficiency to avoid adverse consequences for applications specific quality of service parameters.

In this regards, MAC layer is an imporant place to maintain key performance metrics like latency, reliability, scalability, and energy efficiency [2].

Recently, Time Scynchronized Channel Hopping (TSCH) [2] MAC protocol has been proposed for the IoT. TSCH employs channel diversity and time diversity schemes to combat interference and mutipath fading. Therefore, In this thesis we exploit TSCH as the basis to propose a dual-mode MAC protocol for the mission critical applications of the IoT. The protocol is based on TDMA superframe structure, it has static mode for normal traffic and transient mode for emergency traffic. The protocol targets to achieve reliability, low latency, scalability, and energy efficiency.

## Objectives

- Simulation of the dual-mode protocol in the simulation enviornment.
- Evaluate the key performance metrics like reliability, latency, scalability, and energy efficiency.

## Pre-requisites

- Be familiar with OMNET++ (or any other) simulation environment
- Have a fair undertanding of the MAC sublayer, part of data link layer, in OSI protocol stack.

## References

[1] Al-Fuqaha, Ala, et al. "Internet of things: A survey on enabling technologies, protocols, and applications." IEEE Communications Surveys & Tutorials 17.4 (2015): 2347-2376.

[2] Paventhan, A., et al. "Experimental evaluation of IETF 6TiSCH in the context of Smart Grid." Internet of Things (WF-IoT), 2015 IEEE 2nd World Forum on. IEEE, 2015.