Aalto University
School of Electrical Engineering

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Radio technologies for Internet of Things

Title of the dissertation	Analysis and characterization of short-range and low-power radio technologies for Internet of Things: Protocol and Application Lyhyen kantaman ja matalan tehonkulutuksen esineiden internet-radioteknologioiden analysointi ja karakterisointi: protokolla ja sovellus
Contents of the dissertation	Internet of Things (IoT) creates a network of physical objects realized with sensors, actuators, software and other technologies in order to exchange data over the Internet. IoT enables a networked society by providing new opportunities for industries, and a whole set of new service types (such as intelligent transportation, location-based services, asset tracking, smart monitoring, and management of objects). To enable this vision, various technologies are required to provide seamless connections among heterogeneous objects. Short-range, low-power radio technologies, among others, are the main enablers of the IoT ecosystem. However, to fulfill this vision, many unresolved challenges including reliability, throughput, availability, end-to-end delay and battery lifetime remain to be addressed. To this end, this thesis is an attempt to shed light on some of these challenges related to short-range low-power radio technologies. We consider Wi-Fi, Bluetooth Low Energy and Backscatter Communication System for this thesis which are regarded as suitable technologies in the short-range and low-power radio domains. Furthermore, we provide a comprehensive survey of time synchronization (as an important characterization in wireless sensor networks) for IoT deployment. This work aims at aiding IoT practitioners to select appropriate clock synchronization components, whose importance changes from application to application in IoT deployments. Finally, we introduce an end-to-end IoT application by using short-range radio technology. We developed a low-cost automated indoor localization and tracking system using Bluetooth. This application indicates the importance of short-range radio in realizing IoT applications and services.
Field of the dissertation	Communications Engineering
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Opponent	Professor Carlo Fischione, Royal Technology of Institute (KTH), Sweden
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A doctoral dissertation is a public document and shall be available at Aalto University, School of Electrical Engineering, Maarintie 8, main hall at the latest 10 days prior to public defence.