

Report regarding the PhD Thesis submitted by Martin Štůsek with the title “Research on Reliable Low-Power Wide-Area Communications Utilizing Multi-Rat Lpwan Technologies for IoT Applications”

The thesis addresses the research area of heterogeneous Internet of Things networks, with a focus on low-power wide area technologies for machine-to-machine communications. The work presented in the dissertation is organized in three main topics, namely, low-power wide area propagation models, coverage assessment planning, and multi-rat in massive machine type communications.

The results described in the dissertation include the following components and contributions:

- large-scale measurement campaigns of LPWA technologies in real scenarios, study of propagation models, development of new propagation models and their validation with data collected from the measurements
- development of a framework for assessing network deployments radio conditions with the minimum number of measurement points
- battery life optimization of low-power wide area multi-RAT devices.

The work presented in the dissertation contains several novel scientific contributions, comprising both experimental work and analytical modelling.

The outcomes of the research work have the potential to impact the performance of massive machine type communications comprising both high scientific and practical significance.

The manuscript is very well structured and the three main contributions are aligned towards the improvement of LPWA technologies in dense environments.

The research questions are clearly stated with regards to the state of the art and the problems of LPWA technologies in massive machine type communications. The three main objectives are very relevant to the research community and the results obtained support appropriate answers to the problems identified.

The work presented demonstrates a deep knowledge of the scientific area and the methodology followed is sound and adequate to the problems being addressed. All the contributions developed were clearly motivated, with a focused analysis of the state of the art, formal definition of the problems, together with extensive experimental work and validation procedures.

The candidate has gathered large amounts of research data which was used to support the achievement of the research objectives in a coherent and thorough fashion. In addition to the data collection activities, the candidate has proposed and validated a set of mechanisms in LPWA technologies which show clear advances over the current state of the art.


Analysis of related works in the state of the art is very good, comprising most relevant publications, while demonstrating a deep knowledge of the technologies involved. In particular, the approach of having chapter 2 devoted to generic massive machine type

communications and then, specific analysis of pertinent works is performed in the chapter describing each one of the thesis contribution is appropriate.

The candidate has co-authored a large set of scientific publications (14), being the first author of 4 publications. There are clear contributions to the scientific community which are adequate for a PhD candidate and the publications where the candidate has cooperated with, although not being the first author, also support this consideration. In summary, the publications fulfil the expected outcomes of a doctoral candidate, with some good quality venues.

From the analysis of the dissertation, it is very clear that the candidate has scientific maturity and critical thinking skills. All the requirements expected in a doctoral candidate can be inferred from the content of the dissertation and related publications.

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