András Kalmár

EIT Digital Budapest DTC

PhD topic: Self-optimized clustering and routing in the Internet of Things

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'What I like most in the EIT Digital doctoral education is that the students get business and innovation related knowledge that broadens their mind and – whatever their aims are in life – helps them become more successful.'

Achievements & further plans

Andras is in the final phase of his PhD studies. His initial research topic focused on how to realize **context-aware services in the 'Internet of Things (IoT)' architecture**, in which the number of available context parameters will significantly increase, therefore identifying a specific situation will be easier for computers. Over time, his interest shifted towards the communication aspects of IoT. He started questioning how to realize three basic communication primitives (service-discovery, group addressing and data-centric communication) efficiently, that will be essential for smart and proactive environments in the future. Andras is currently spending his geographical mobility in Stockholm at SICS NES Group under the supervision of Simon Duquennoy.

We can create smart and proactive environments, that can adapt themselves to the users and the current situation. In this way, we can enhance the user experience, make these places more secure and save energy by controlling the the heating/cooling/lighting systems more properly.

Educational status at Spring semester of 2016:

RA	OR	BMD	GH	Mobility	BDExp.
✓	✓	✓			

Reserach topic

In the beginning of his PhD studies Andras examined how a special machine learning method, "Hierarchical Temporal Memory" that imitates some of the structural and algorithmic properties of the human brain, can be used for realizing context-aware services in the Internet of Things architecture. It can process continuous data stream in real time and it can handle huge amounts of data as well due to its hierarchical structure. Therefore, it can be a good solution for dealing with the so called "big data" created by the IoT infrastructure in the future. Over time, his interest turned toward the communication aspects of IoT infrastructure. He suggested a special addressing and routing scheme for IoT devices in which the user can query IoT devices based on their feature and context (i.e., query all the windows situated in a specific room to close them, switch off the lights in a given corridor, etc.). Three main communication primitives can be realized with this scheme: service discovery, group addressing and data-centric communication, which will be essential for the smart and intelligent environments of the IoT world. Moreover, simulation and experimental results show that efficiency is significantly increased compared to the state-of-the-art solutions that are specified for each of these functions. In particular, the number of signalling messages is much less than in other solutions. Additionally, this has been the only way to realize efficient multicast until now in the IoT domain.