Keynote 5: “Towards semantic interoperability in Internet of Things and beyond”

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Abstract: Lack of interoperability of Internet of Things (IoT) platforms / systems / applications (artifacts) is being recognized as an important issue that prevents faster development of IoT ecosystems (including Smart Grids / Homes / Neighborhoods, office buildings, etc.). While interoperability can be considered on many levels, in the presentation I will focus on semantic interoperability. Moreover, while originating from IoT scenarios, the proposed approach can be naturally applied outside of the Internet of Things.

Based on our recent work, we came to the conclusion that we have to assume that: (i) research should focus on joining multiple (at least three) artifacts, and (ii) existing / to be joined artifacts should not be modified (due to the resistance of stakeholders), and (iii) typically, such artifacts do not have semantics represented in the OWL language. We also have to assume that, at least for the time being, establishing interoperability will be guided by representatives of stakeholders (we thus omit considerations related to the discovery and inclusion of services “from the WWW”).

Therefore, we have propose the following approach leading towards establishing semantic interoperability:
(1) Modular ontology consisting of: (a) core vocabulary (of the IoT), and (b) domain specific modules (facilitating communication concerning given “topic” – one or more modules for each “topic”) has to be developed. (2) Semantics of each artifact has to be extracted and lifted to OWL (providing foundation for semantic translations). (3) Translators (bidirectional – producer and consumer) between the “local vocabulary” and the “lifted vocabulary” have to be created. (4) Alignments (“directional”) between ontologies representing each entity, and appropriately selected modules of the central ontology have to be instantiated and stored. They will be used in data translations.

The aim of the presentation will be to provide details of the above described proposal for reaching semantic interoperability (in IoT ecosystems). Furthermore, results concerning efficiency of the proposed approach will be presented. Research presented in the talk is being supported by EU-H2020-ICT grant INTER-IoT 687283. Since the project is ongoing, subsequent publications materialize (as technical reports) at: http://www.ibspan.waw.pl/~paprzyck/mp/cvr/research/IoT.html

Biography

Marcin Paprzycki is an associate professor at the Systems Research Institute, Polish Academy of Sciences. He has an MS from Adam Mickiewicz University in Poznań, Poland, a PhD from Southern Methodist University in Dallas, Texas, and a Doctor of Science from the Bulgarian Academy of Sciences. He is a senior member of IEEE, a senior member of ACM, a Senior Fulbright Lecturer, and an IEEE CS Distinguished Visitor. He has contributed to more than 450 publications and was invited to the program committees of over 500 international conferences. He is on the editorial boards of 12 journals and a book series. To reach him, please visit http://www.ibspan.waw.pl/~paprzyck/.