



HAL
open science

Towards Stream-based Reasoning and Machine Learning for IoT Applications

Markus Endler, Jean-Pierre Briot, Vitor P. Almeida, Francisco Silva E Silva,
Edward H Haeusler

► To cite this version:

Markus Endler, Jean-Pierre Briot, Vitor P. Almeida, Francisco Silva E Silva, Edward H Haeusler. Towards Stream-based Reasoning and Machine Learning for IoT Applications. IEEE Intelligent Systems Conference (IntelliSys'2017), London, U.K., September 2017., Sep 2017, London, United Kingdom. ⟨hal-01433729v3⟩

HAL Id: hal-01433729

<https://hal.sorbonne-universite.fr/hal-01433729v3>

Submitted on 13 Feb 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

Towards Stream-based Reasoning and Machine Learning for IoT Applications

– *Abstract*

Markus Endler
Dept of Informatics, PUC-Rio
Rio de Janeiro, Brazil
Email: endler@inf.puc-rio.br

Jean-Pierre Briot
LIP6, UPMC–CNRS & Dept of Informatics, PUC-Rio
Paris, France Rio de Janeiro, Brazil
Email: Jean-Pierre.Briot@lip6.fr

Vitor P. de Almeida
Dept of Informatics, PUC-Rio
Rio de Janeiro, Brazil
Email: valmeida@inf.puc-rio.br

Francisco Silva e Silva
LSDi, Univ. Federal do Maranhão
São Luis, Brazil
Email: fssilva@lsdi.ufma.br

Edward H. Haeusler
Dept of Informatics, PUC-Rio
Rio de Janeiro, Brazil
Email: hermann@inf.puc-rio.br

Abstract—As distributed IoT applications become larger and more complex, the pure processing of raw sensor and actuation data streams becomes impractical. Instead, data streams must be fused into tangible facts and these pieces of information must be combined with a background knowledge to infer new pieces of knowledge. And since many IoT applications require almost real-time reactivity to stimulus of the environment, such information inference process has to be performed in a continuous, on-line manner. This paper proposes a new semantic model for data stream processing and real-time reasoning based on the concepts of *Semantic Stream* and *Fact Stream*, as a natural extension of Complex Event Processing (CEP) and RDF (graph-based knowledge model). The main advantages of our approach are that: (a) it considers time as a key relation between pieces of information; (b) the processing of streams can be implemented using CEP; (c) it is general enough to be applied to any Data Stream Management System (DSMS). Last, we will present challenges and prospects on using machine learning and induction algorithms to learn abstractions and reasoning rules from a continuous data stream.

Keywords—*Internet of Things (IoT); sensors; data streams; complex event processing (CEP); semantic reasoning; inference; machine learning.*