

Master 2 Research Internship, 2020–2021

# Privacy protection with Usage Control in the Internet of Things

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**Keywords:** Distributed Systems, Internet of Things, Privacy, Usage Control, DEBS Middleware.

**Subject** The Internet of Things (IoT) [1] offers promising opportunities for the development of new context-aware software services. However, it also comes with new challenges regarding the privacy of the users and it is essential to integrate privacy protection mechanisms at all levels.

The IoT can be seen as a set of producers of data, in particular sensors present in the environment, indirectly publishing a set of data to consumers through a network of brokers. In order to disseminate data at the scale of the IoT, a Publish/Subscribe approach as implemented by a Distributed Event-Based System (DEBS) meets the performance objectives. Advertisement filters, indicating the events issued by a producer, and subscription filters, describing events of interest to a consumer, are registered in the network of brokers.

A challenge is then to filter the large amount of data transmitted in order to scale when the number of producers or consumers increases and ensure that only authorised consumers according to access control policies will be able to receive the context data. Several state of the art solutions already offer pub/sub systems with access control. The objective of this Master thesis is to go further by also integrating usage control according to the UCON model [5, 4], which consists in verifying that data consumers are respecting the purpose of the treatments initially announced. This work will be based on previous contributions of the team ([2], [3]).

## Expected Results

- A distributed software architecture integrating usage control within the pub/sub [muDEBS](#) open source framework.
- A prototype for evaluating the proposed solution.
- Submission of a research article detailing the contribution and its position with respect to the state of the art.

The source code and the written documentation will be provided with a [GNU/LGPL license](#) and a [GNU/GFDL license](#), respectively. The artefacts are versioned into a Git repository at Télécom SudParis.

## Practical information

- Starting date: February 2021 (flexible)
- Duration: 5 or 6 months
- Location: Télécom SudParis, Évry or Palaiseau campus (<https://www.telecom-sudparis.eu/>)

## To apply

Contact the two advisors with the following information (in French or in English):

- a motivation letter
- CV
- academic transcripts of the last 3 years
- a previous report, internship or article written by the candidate.

## References

- [1] L. Atzori, A. Iera, and G. Morabito. The Internet of Things: A survey. *Computer Networks*, 54(15):2787–2805, 2010.
- [2] S. Coroller, S. Chabridon, M. Laurent, D. Conan, and J. Leneutre. Towards end-to-end privacy for publish/subscribe architectures in the internet of things, <https://hal.archives-ouvertes.fr/hal-01940866/document>. In *Proceedings of the 5th Workshop on Middleware and Applications for the Internet of Things, M4IoT@Middleware, Rennes, France*, pages 35–40, Dec. 2018.
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- [4] A. Lazouski, F. Martinelli, and P. Mori. Usage control in computer security: A survey. *Computer Science Review*, 4(2):81–99, 2010.
- [5] J. Park and R. Sandhu. The UCON ABC Usage Control Model. *ACM Trans. Inf. Syst. Secur.*, 7(1):128–174, Feb. 2004.