

# Security&Privacy challenges in IoT

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**Abstract**—The research activity started from the definition of a protocol for securing communication in hybrid WSN (Wireless Sensor Network) context, taking into account the confidentiality, integrity and anonymity of the transmitted information, as well as traffic congestion and resources consumption issues. The work currently focuses on the security and privacy issues related to Internet of Things (IoT), starting from the definition of a conceptual model to the development of IoT privacy-aware solutions and the privacy policies enforcement.

## I. RESEARCH ACTIVITY

Alessandra Rizzardi received BS and MS degree in Computer Sciences with 110/110 cum laude at University of Insubria, in Varese, in 2011 and 2013 respectively. Since 2011 for her MS thesis, she began working in the research group of Prof. Alberto Coen-Porisini and Dr. Sabrina Sicari. Since November 2013 she is a PhD student at the University of Insubria, under the guidance of Dr. Sabrina Sicari.

Her research activity started from the definition of a protocol called SETA (SEcure sharing of TAsks in clustered wireless sensor networks), which was defined during her MS thesis work. Such a work was presented and published in the Proceedings of the 1st International Workshop on Internet of Things and Communications Technologies (IoT'13) in Lyon on 7 October 2013 [?]. SETA provides a solution to meet security requirements in one of the most important enabling technologies for IoT: wireless sensor networks. In fact, SETA guarantees:

- Confidentiality, integrity and anonymity of the information transmitted over the network.
- Traffic control, in order to avoid the occurrence of states of congestion and, consequently, loss of information.
- Reduction of the devices power consumption with limited computational resources.
- Sensor nodes localization.

Alessandra Rizzardi also worked on hybrid architectures and on the Wireless Multimedia Sensor Networks (WMSN), combining the same issues addressed for WSN and images compression techniques.

With the beginning of PhD course, Alessandra Rizzardi starts to study the IoT paradigm, open issues and challenges. Internet of Things is a keyword which cover various aspects related to the extension of the Internet and the Web into the physical world in order to make available new kinds of services. IoT paradigm is to connect "everything and everyone everywhere to everything and everyone else". Notice that

an interesting fact is about the number of devices involved in the machine-to-machine (M2M), communication, which is expected to grow steadily until 2020. In order to allow this innovation there is the inclusion of embedded electronic devices within objects of every day life, so as to make them "smart" and allowing them to integrate into a global infrastructure which includes heterogeneous entities that exchange information and perform actions in relation to their surroundings. The involved technologies are: wireless sensor networks, RFID, sensors, actuators and so on. IoT technologies are used in many scenarios: smart-cities, health-care, industrial applications, military applications, environmental monitoring. In order to allow the spread of IoT paradigm in real life, several issues should be addressed:

- Security and privacy.
- Trust both among users and devices and among devices.
- Support and responses at runtime according to the users needs.
- High dynamic and scalability of the distributed system, where each entity/thing acts as a producer and/or consumer of data.
- Integration among heterogeneous devices which are not fully compatible.
- Questions about the semantics of the communication between heterogeneous devices.

Therefore, security, privacy and trust are critical requirements to enable a large-scale deployment of IoT applications. Alessandra Rizzardi focuses her work on such issues. The research activity starts from a detailed analysis of the state of the art as regards current approaches and European projects to security and privacy in IoT. As regards privacy, she is defining a conceptual model in order to establish the involved entities, the relationships among them and ad hoc privacy policies. Notice that such a model represents the starting point for the development of IoT privacy-aware solutions and for the enforcement of the privacy policies themselves. Moreover, she is developing a prototype related to a possible architecture for IoT, with integration capabilities, communication protocols, security and quality management of acquired or provided information. Finally, in order to better evaluate the node reputation and the related data quality, Alessandra Rizzardi is also working on a score reputation mechanism exploiting machine learning techniques.