	Secure Data Management in e-Health Applications through the Advanced Open-source Security Platform SE*cube*™
Parole chiave	SECURITY, SECURE DATA MANAGEMENT, E-HEALTH, EMBEDDED SOFTWARE, OPERATING SYSTEMS, EMBEDDED SYSTEMS, DIGITAL SYSTEM DESIGN, SYSTEM LEVEL DESIGN & TEST, OPEN-SOURCE
Riferimenti	Paolo PRINETTO
Riferimenti esterni	Pascal TROTTA (PhD student), Giuseppe AIRO´ FARULLA (PhD Student), Tiziana MARGARIA (*Lero*, Limerick, Ireland).
Gruppi di ricerca	TESTGROUP - TESTGROUP,
Tipo tesi	EXPERIMENTAL
Descrizione	***Motivations***: Nowadays, many services and applications need to be secured in order to guarantee the users' privacy as well as the commercial and legal issues related to security threats and to safeguard the business stakeholders. While several standards, protocols and algorithms exist for handling the basic primitives for security (i.e., confidentiality, authentication, privacy), their implementation in real objects may require very high expertise and efforts. The development of the Advanced Open-source Security Platform SE*cube*™ (Secure Environment Cube) tries to fill this gap providing heterogeneous security-oriented hardware, coupled with an open-source modular software architecture In the Platform, all the functional blocks are isolated and well documented in order to deliver to developers an easy-way to build, understand, modify, and rewrite the whole system if wanted. The SE*cube*™ hardware consists of a single System-on-Chip (SoC) composed of three main blocks: (i) a low-power ARM Cortex-M4 processor, (ii) a flexible and fast Field-Programmable-Gate-Array (FPGA), and (iii) an EAL5+ certified embedded SmartCard. All these features make the SE*cube*™ platform perfectly suitable for a wide range of applications where security is a major concern, and especially for applications focusing on data creation and subsequent storage and management. Data-management applications are focused around so-called *CRUD* actions that Create, Read, Update, and Delete data from persistent storage. These operations are the building blocks for numerous applications, including, for instance, dynamic websites where users create accounts, store and update information, and receive customized views based on their stored data. When the data managed are sensitive, then security is a concern and the use of these actions must be controlled. This is especially the case for e-Health applications, where data to be managed represent very personal information about a patient, his contacts, medical records, as well as diagnosis and therapies. Concerns about data, however, should not slow down the development of e-Health applications. For all these reasons, the development of a middleware capable of reliable data management, leveraging on secure platforms, such as the SE*cube*™ platform, is envisaged.

Goal of the thesis:

- Software stack and requirements definition for a data management system to be integrated in (or added in the top of) the operating system running on SE*cube*™, as well as the definition of the capabilities and possibilities offered by the platform.
- Definition and implementation of the necessary set of primitives and operations for e-Health applications (e.g., adding and removing a patient, direct contact among clinicians and patients, checking patient's history and recoveries…).
- Selection and setup of a reference use case (e.g., secure remote glucose monitoring and automated retina check for diabetic patients).
- Implementation and demonstration of the considered test case to test the data-management system (and possibly a SDK to offer programmers with high level APIs to be integrated in highly automated clinicals procedures).

Learning outcomes:
The candidate will acquire valuable and in-depth abilities to develop and deploy applications both for e-Health scenario or next-generation embedded systems, with particular emphasis on security and privacy aspects and associated software requirements.

External/Industrial cooperations:
The thesis will be carried out in collaboration with:

- *Blu5* View Pte. Ltd. (Singapore)
- *Lero*, the Irish Software Research Centre (Limerick, Ireland)
- *LIRMM* (Montpellier, France).

Conoscenze richieste	Programming Languages: C / C++, Software Engineering, Embedded Systems
Note	Number of required Students: 1 or 2
Scadenza validita proposta	31/12/2016

PROPONI LA TUA CANDIDATURA