Proposition de recherche doctorale

Secure Communications in Wireless Body Area Networks.

Mots clés : Array

- Directeur de thèse : Farid NAIT-ABDESSELAM
- Co-encadrant(s) :
- Unité de recherche : Laboratoire d'Informatique PARis DESCartes
- Ecole doctorale : École Doctorale Informatique, Télécommunications, Électronique de Paris
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Résumé du projet de recherche (Langue 1)

The recent advances in wireless sensing technology have led to the emergence of a wide range of applications in different domains such as medical treatments, sports, consumer electronics, social networking, and enterprise usage. Among those emerging applications, e-Health is recognized as the most important and promising one due to its potential for monitoring of chronic illnesses, lifesaving in emergency situations, and its ability to provide round the clock healthcare to rural and disadvantaged areas.

In particular, wireless body sensors (WBS) are the key enablers of remote and in-hospital health monitoring and are expected to revolutionize the health and real-time body monitoring industry. However, WBS technology (also referred as WBAN) alone is not sufficient to achieve the ultimate goal of e-Healthcare stakeholders, and other advanced technologies such as Internet of Things (IoT) and Cloud Computing are also needed to further improve the e-Health monitoring system efficiency. Thus, we believe the rapid technological convergence between IoT, WBANs and Cloud Computing would significantly contribute to the emergence improvement of e-Healthcare, thereby improving the quality of medical care.

In particular, patient-centric e-Health monitoring plays a vital role in e-Healthcare service, involving a set of important operations ranging from medical data collection and aggregation, data transmission and segregation, to data analytics. This thesis aims at exploring the tradeoffs between performance goals and security metrics of e-Health monitoring systems. Firstly, we present an architectural framework to describe the entire monitoring life cycle of e-Health monitoring systems and identify the essential service components. Additionally, more detailed discussions are then devoted to data collection at patient side, which is considered as a fundamental basis in achieving robust, efficient and secure e-Health monitoring. As a result of these in-depth analysis, we firstly present a novel CPS-enabled e-Health monitoring system using virtual sensor networks (VSN). Then we will tend to propose a lightweight authentication protocol, specially tailored to WBS (WBAN). Both of the two designs attempt to achieve the best tradeoff between those identified security and performance metrics, and they are thoroughly validated through both theoretic analysis and simulations.

Keywords: e-Healthcare, Wireless Body Area Networks, Cyber Physical Systems, Mobile Crowdsensing, Security, Privacy, Trust.