PhD Thesis **Quentin BRAMAS**

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Title: Self-organizing, Mobility Aware, Reliable and Timely Body-Area-Networks

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Abstract: The thesis aims to optimize the energy consumption of wireless Body Area Networks for medical applications while minimizing its impact on the human body. To do so, a trans-disciplinary approach will be undertaken. The impact of the physical layer will be taken into account in MAC and Network layers to draw fundamental energy limitations and to develop optimal communication strategies for reliably routing and agregating data in medical Body-Area-Networks. The goal is to propose models of medical Body-Area-Networks and strategies for routing and information diffusion in Body-Area-Networks.

Several measurement campaigns have been conducted in various BAN projects, in order to evaluate the channel behavior and evolution when an equipped user walks, runs, falls, etc. These measurements are often realized on a point-to-point link in a single scenario and the approach may fail in giving sufficient insights related to what could be obtained through multi-sensors on the same body. Our goal, in this task, is to provide a model of the network topology and of its dynamicity with the wearer movement. Based on the individual measurement campaigns realized in partner projects, our aim is to create a generic and configurable dynamic graph model that complies with all measurements and represents the following dynamic aspects: α. dynamic/flexible topology β. temporarily unavailable links χ. links with variable reliability Two theoretical models for dynamic networks are natural candidates: a. Time-varying graphs b. Temporal reachability graphs. In the evaluation part of our project we plan to consider two different scenarios. First, the remote patient monitoring aims at collecting statistical. The pace is supposed to be low, and the main issue is the saving of energy and the inference of patient activities without being intrusive. The second one relies on a hospital infrastructure and is expected to trigger with extreme velocity life-threatening alerts. The pace is supposed to be high, and the main issue is timeliness of alert reporting.