Innovative smart services design from connected objects

Laboratoire d’Informatique en Image et Systèmes d’information

Arthur Gatouillat
SOC Team
Advisor: Youakim Badr
Introduction

What is the scientific problematic?

- Context: Increase of communicating objects
- Problems:
  - Interoperability
  - How to handle the generated data (which can be big)
  - Limited resources
  - Cyber-physical properties
- Goal: Building Internet-of-Things (IoT) enabled systems
In order to build IoT enabled systems, we found that it is necessary to specify a **composable self-adaptable connected object model**.

This brings several research directions:

- How to model connected objects? (This will be the main focus as it is what I am currently working on)
- What are the **composability** requirements?
- How can a system **self-adapt**?
Connected Object Component Model

**Information Model**
- **<Connected Object>**
  - **Sw Attributes**
  - **Hw Attributes**
  - **Resources**

  **Sensors:** <Artifact>
  **Controllers:** <Artifact>
  **Actuators:** <Artifact>
  **Plant:** <Artifact>

- **Lifecycle:**<transitions, services, rules>
- **Control Loop:**<Mission, Monitor, Effect>
- **Self-Adaptive Loop:**<Objective, Adaptation, Monitor>

**Lifecycle**
- **<Services, Rules>**
- **<States, Transitions>**

**Feedback Control Loop**
- **Input**
  - **Controller**
  - **Actuators**
  - **Physical Plant**
  - **Sensors**

  [Hellerstein et al. 2004]

**Self-Adaptive Loop**
- **SLA**
  - **Objective FL**
  - **Adaptation FL**
  - **Monitor**

  [Villegas et al. 2013]
A prototype of connected object

- Body core temperature sensor
- Respiratory Belt
- Processing Unit
- Pulse monitor

Required biomedical sensors to derive sleepiness

Wi-Fi connectivity