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FOR INFORMATION TECHNOLOGY
AND COMPUTER SCIENCE

InfortechDay 2019
Internet of Things

May 20th, 2019, 10:00-17:00
Université de Mons, Belgium
Venue: De Vinci building, Salle des Conseils (1st floor)

10:00 Welcome

10:20 Technical session 1 (20 minutes/talk)

- **Energy harvesting in nuclear environments - A solution to power WSNs used for monitoring?**
  Alexandre QUENON

  Abstract: *From electricity production to medical processes, nuclear applications are numerous and useful. But they also are hazardous for both the environment and human beings, which means that they must be monitored. A solution to perform remote monitoring of nuclear environments consist in using wireless sensor networks. Still, a remaining issue is the battery replacement, which requires human intervention. To overcome this situation, energy harvesting can be implemented to power the nodes of the sensor networks. In this presentation, energy harvesting methods are reviewed and their application to nuclear environments monitoring is analyzed.*

- **Precise localization using ultra wideband technology**
  Maximilien CHARLIER

  Abstract: *Ultra wide-band (UWB) is a wireless communication technology that allows centimeter-scale localization. It has been standardized for low power devices as part of IEEE 802.15.4 in 2007. The level of precision achieved by UWB makes new kind of applications possible such as indoor localization for museum, object tracking and geofencing. Our work focuses on designing UWB architectures for high-rate and large-scale localization by combining time-division multiple access with the simultaneous use of different physical channels.*

- **Optical fiber sensors for IoT**
  Antonio BUENO MARTINEZ

  Abstract: *Due to the huge number of required sensors in the coming generation of IoT,*

sensing devices need to be cheap, easy to design, and resilient, in addition to their accuracy and instantaneous response. Optical fiber sensing is one of the more attractive emerging technologies due to the inherent advantages of the optical fiber sensors such as low-cost fabrication, lightweight and immunity to electromagnetic interferences among others.

- **Fab-IoT-Lab: Technological Expertise, Guidance and Prototyping Skills in a Single Place**
  François ROLAND

  Abstract: *The complexity of designing connected objects or introducing them in industrial processes lies in the many required skills. Some research labs are studying advanced topics and can provide a focused expertise. Some projects offer a shared infrastructure to elaborate and test new products and algorithms. Some organizations provide guidance and technological advice. The Fab-IoT-Lab project brings all these skills and competencies in a single place so that entrepreneurs and industries can benefit from the strengths of these existing structures without sacrificing the high-level, multi-disciplinary point of view.*

11:40 Poster pitches (2 minutes/pitch)

- Sustainable electronics based on Wireless Power Transfer techniques: main contributions from the COST ACTION IC1301 (*Fortunato DUALIBE*)
- Toward accurate clock drift modeling in WSN (*David HAUWEELE*)
- Experimental setup to monitor how the environment impacts the transmission of LoRa frames (*François ROLAND*)
- Visible Light Communication in the context of Smart Cities (*Véronique MOEYAERT*)
- Broadband PLC in railway signaling: An IoT use-case (*Aurélien VANLAERE*)
- IoT data analysis for Smart Farming : the WalleSmart project (*Fabrice Bellarmin NOLACK FOTE*)
- Comparative Study of Dimensionality Reduction Methods in Large Scale Image Retrieval (*Mohammed Amin BELARBI*)

12:00 Sandwiches and Poster session

13:00 Keynote

- **LoRa's Jambalaya**
  Fernando KUIPERS (TU Delft, The Netherlands)

  Abstract: *Many research and industrial communities are betting on LoRa, an abbreviation of Long Range, to provide reliable, long-range communication for the Internet-of-Things. Although LoRa is promising, there are several aspects that deserve scrutiny, namely:*
  - *LoRa provides widely heterogeneous coverage; a LoRa link may span hundreds of meters or tens of kilometers, depending on the surrounding environment. This high variability is not captured by popular channel models for LoRa, and on-site measurements are impractical due to the large geographical areas involved.*
  - *LoRa is typically used together with the MAC protocol LoRaWAN and operates in the license-free ISM-bands. As such, anyone is allowed to deploy their own LoRaWAN*

network, provided that they adhere to the LoRaWAN specification and ISM regulations. However, an un- coordinated deployment of LoRaWAN networks may cause neighboring networks to interfere and LoRaWAN frames to collide.
- *Given that LoRaWAN is fairly novel, its level of security needs to be thoroughly analyzed.*

In this talk, I will present (1) a novel, automated approach to estimate the coverage of LoRa gateways prior to deployment and without on-site measurements, (2) an in-depth investigation of LoRaWAN frame collisions – and the capture effect in particular – through various experiments, and (3) a systematic study of the security elements of the LoRaWAN protocol stack and its vulnerabilities.

Biography: *Fernando A. Kuipers is an associate professor and head of the Lab on Internet Science at Delft University of Technology (TU Delft). In 2004, he obtained his Ph.D. degree cum laude, the highest possible distinction at TU Delft. His research focus is on network optimization, network resilience, Quality of Service, and Quality of Experience and addresses problems in Software-Defined Networking, Tactile Internet, Internet-of-Things, and critical infrastructures. His work on these subjects include distinguished papers at IEEE INFOCOM 2003, Chinacom 2006, IFIP Networking 2008, IEEE FMN 2008, IEEE ISM 2008, ITC 2009, IEEE JISIC 2014, NetGames 2015, and EuroGP 2017. Fernando Kuipers is senior member of the IEEE and was a visiting scholar at Technion - Israel Institute of Technology (in 2009) and Columbia University in the City of New York (in 2016).*

14:00 Coffee break

14:20 Technical session (20 minutes/talk)

- **Traffic differentiation in Wireless Sensor Networks**
  Jeremy DUBRULLE

  Abstract: *Routing in Wireless Sensor Networks, a subset of the Internet of Things, is a real challenge since it must interconnect highly constrained devices using low power and lossy radio while serving potentially antagonistic constraints and performance criteria. RPL is the most prevalent standard routing protocol trying to meet these requirements. Sensors sometimes need to send different types of information (such as sensible or time-sensitive data) where packets may follow different paths to the destination due to constraints. In order to allow such types of traffic, multiple concurrent RPL "instances" may be used to enable traffic differentiation and quality of service. This presentation aims to introduce the key principles and challenges of routing information in such networks.*

- **Optimization of an industrial 802.15.4e deployment**
  Manon MOULIN

  Abstract: *Pharmaceutical industries, and specifically those using clean rooms, are targeting an evolution of the data transfer of their production sensors from a wire to a wireless propagation medium while keeping a total reliability. The Biocloud 4.0 solution consists in an hybrid use of commercially available wireless system together with a frequency compatible radiating cable. Large scale tests are currently being realized to determine the efficiency of the proposed solution.*

The presentation will highlight the Biocloud 4.0 solution requirements, the test environment, the system data to be captured for system performance monitoring as well as their method of analysis.

- **Reliable Wireless Sensor Networks communications with TSCH and 6TiSCH MSF**
  David HAUWEELE

  Abstract: *The IEEE 802.15.4 communication standard for WSN originally targeted a best-effort service only and did not intend to provide high reliability communication. This changed with a new amendment of the standard which proposed TSCH, a combination of TDMA and channel-hopping to achieve both high reliance against interference and very low energy consumption. The 6TiSCH architecture offers through the 6P protocol the means to manage such a 6LoWPAN/TSCH network. In 6P, simple transactions allow for two adjacent nodes to reserve cells in the TSCH slotframe. 6TiSCH delegates the selection and decision to add/remove reserved cells to a scheduling function. In this talk, we discuss the Minimum Scheduling Function (MSF) an ongoing work at the IETF, and present early results of a performance evaluation.*

- **Decision tool network – Monitoring of herds in pasture**
  Justine PLUM

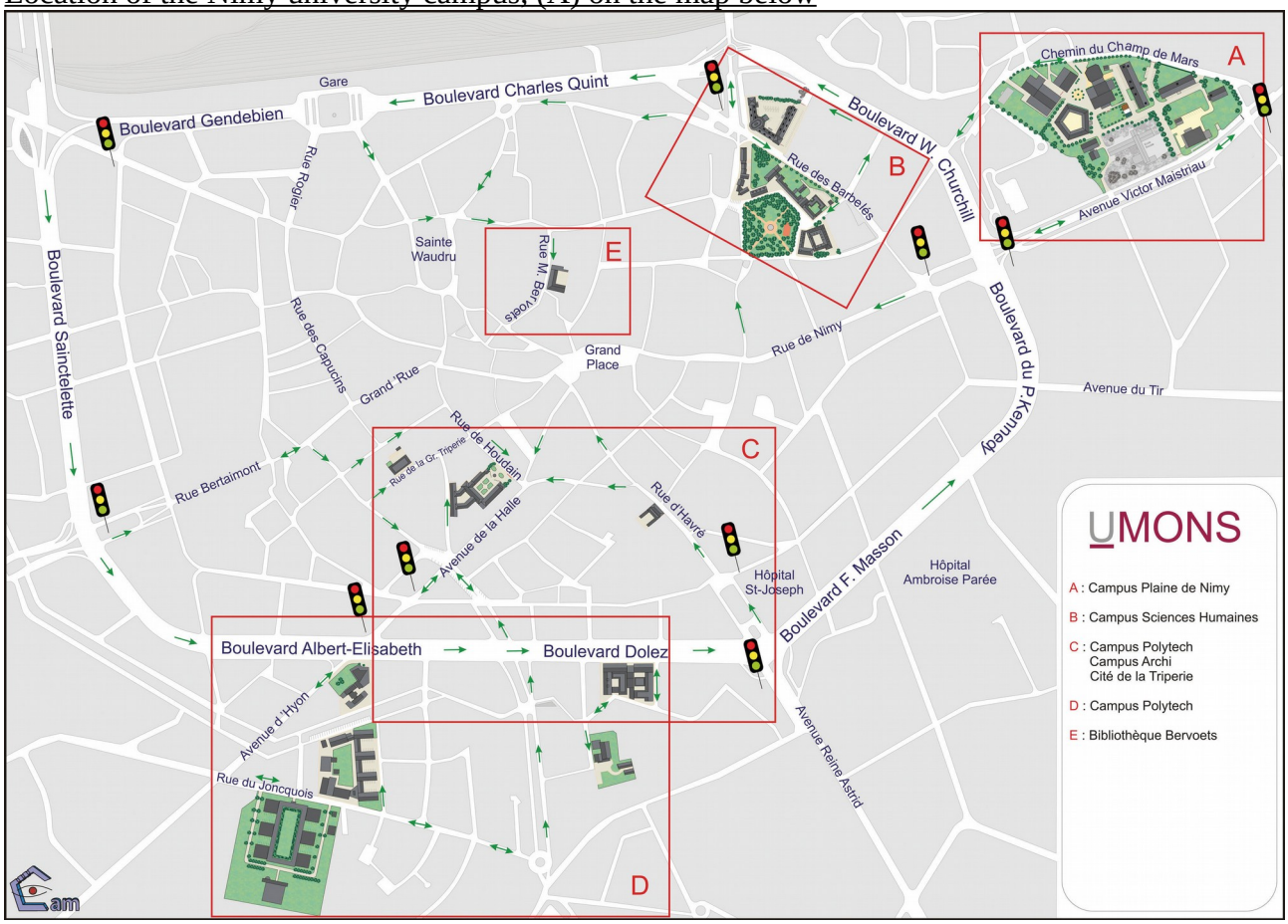
  Abstract: *The aim of the ROAD-STEP project is to help farmers monitor their herd remotely and detect abnormal behavior automatically. To this end, 3D pictures of cows will be taken automatically when they reach the water trough. These pictures will be processed locally in order to compute some reduced parameters (BCS, Lameness index) as indicators of their health. This synthetic information will then be sent to the farmer over a low-power wide-area network to enable him to take action on his sick animals. This method makes it possible to act at an early stage of the problem and improve animal well-being.*

- **Batch and Stream Processing of IoT Data with Apache Beam**
  Olivier DEBAUCHE

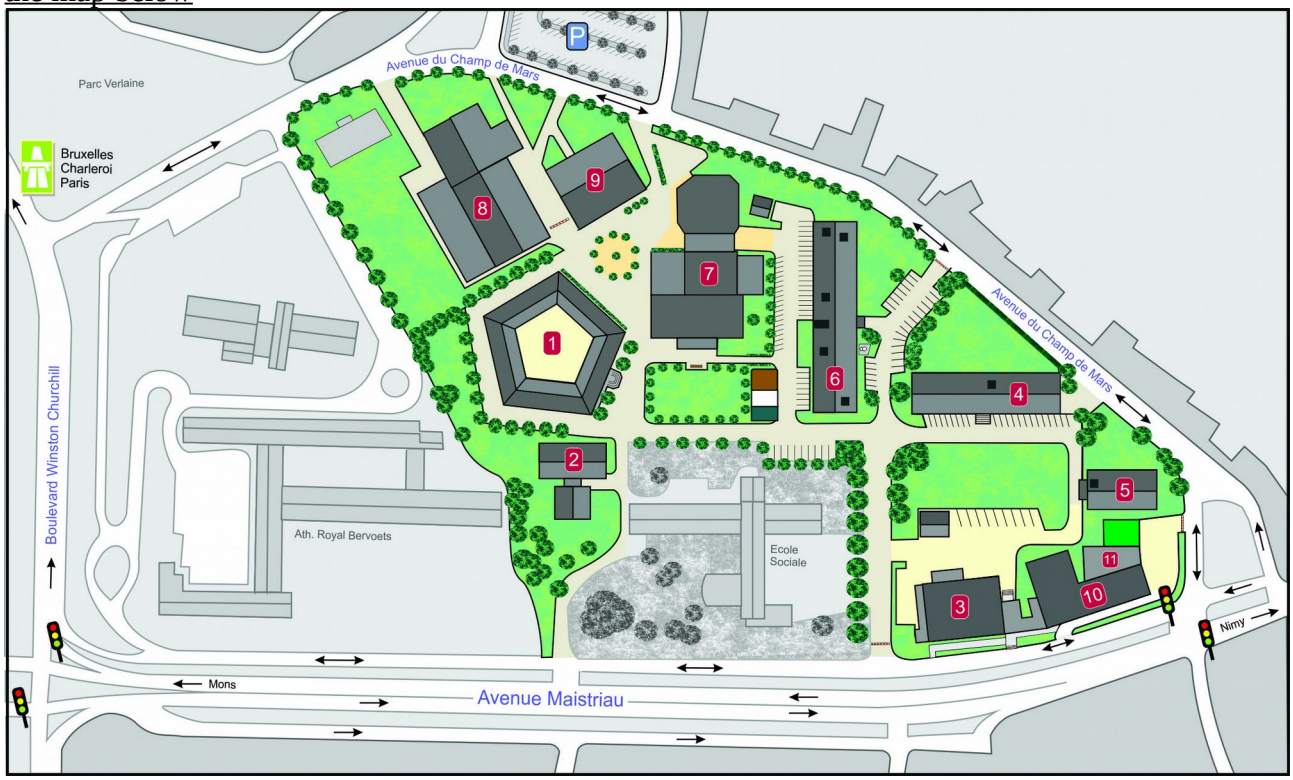
  Abstract: Apache Beam is an open source, unified model and set of language-specific SDKs for defining and executing data processing workflows. We use Beam in Internet of Things in order to build a cloud architecture and also for processing data in real time. The use of Apache Beam is very useful in such architectures, because it can be deployed on many pieces of softwares. In this technical presentation, we introduce the use of Beam Apache Application in order to identify farm animals' behavior by means of connected objects.

16:00 Drink

Location of the Nimy university campus, (A) on the map below



Location of the meeting room, **Mendeleïev/De Vinci** building, room "Salle des Conseils" (10) on the map below



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