



From Dusk Till Dawn: Harvesting Energy from Artificial and Diffuse Low-Intensity Solar Radiation for Secure IoT Applications in Indoor Environments (FADE)

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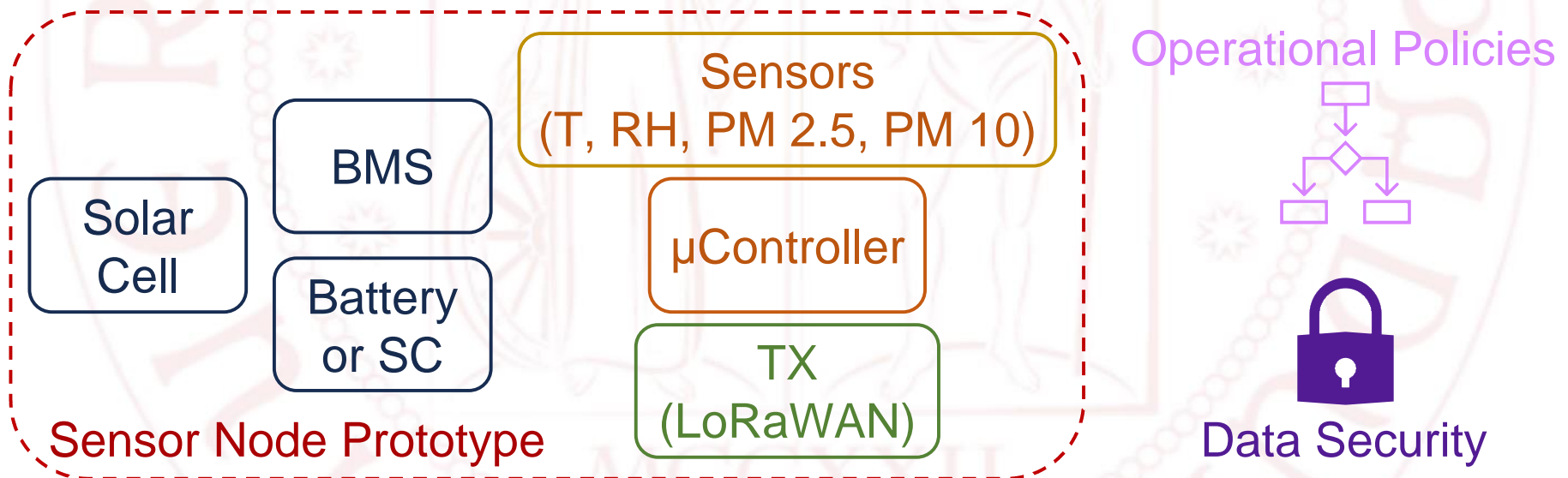
- The Internet of Things (IoT) is a paradigm in which **millions of devices** (having sensors, actuators, computational power, etc.) are able to **connect** and exchange information one another over the Internet and similar communication networks
- One of the most **challenging** aspects is the **energy requirement** of IoT battery-powered devices, especially the ones deployed in **harsh contexts**
- **Energy harvesting** systems are a remedy, making such devices potentially **energy self-sufficient**
- Exploiting **artificial and diffused light** as energy source is a valuable alternative for powering IoT devices indoor deployed

- The project aims at implementing an **integrated monitoring platform**, that is equipped with local or wide area **connectivity** for data transmission
- The platform can **autonomously operate** thanks to an **energy harvesting** solution based on the use of **solar cells**
- The energy harvesting system can power the platform by exploiting **diffuse sunlight** (i.e., without direct irradiation) or **artificial light** within **indoor environments**

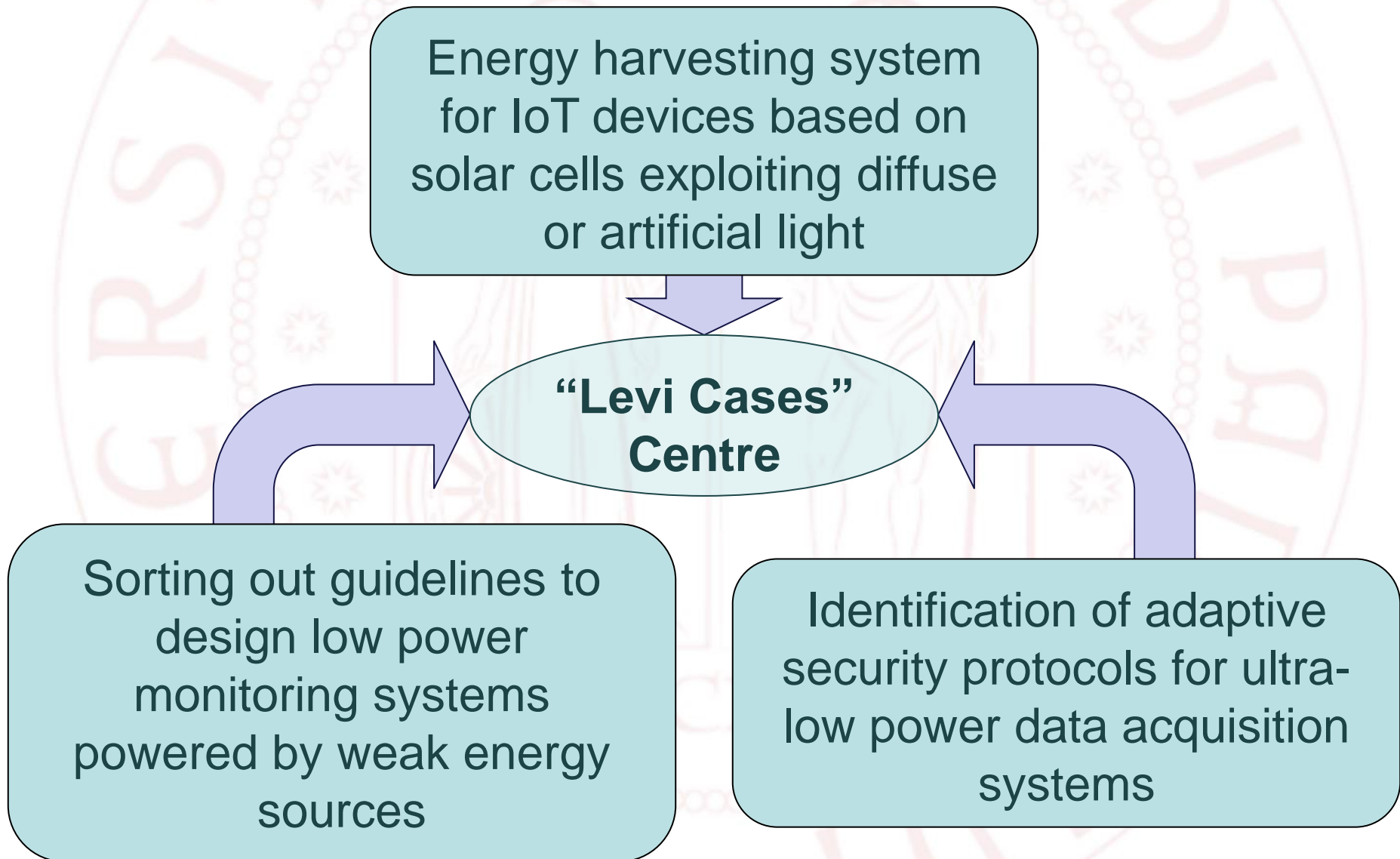
- **Diffuse and artificial light** are rarely exploited as energy sources for **micro-energy harvesting** solutions within the IoT domain
- The literature has works treating the characterization of solar cells in these conditions, but **few papers** can be found **developing self-sufficient monitoring platforms** exploiting these energy sources
- **Operational policies** focusing on devices energy **self-sufficiency**, and managing **security** and **data protection**, were widely tested through simulations, but **partially proven on the field** exploiting prototypes

- Many experimental activities will be carried out involving several skills enhancing the level of **interdisciplinarity**
- Reference SSD: **ING-INF/07** Electrical and Electronic Measurements
- Involved SSDs: **ING-INF/01** Electronics
ING-INF/03 Telecommunications
ING-INF/05 Information Processing Systems
INF/01 Informatics

- Demonstrate the feasibility of an energy self-sufficient distributed measurement system powered by small solar cells harvesting diffused or artificial light in indoor environments



- Characterise the **performance** of small **commercial solar cells** in conditions of diffuse or artificial light
- Develop an **environmental monitoring platform** exploiting those solar cells as energy source
- Implement **data transmission** with Long Range Wide Area Network (**LoRaWAN**)
- Implement adaptive **operational functioning schemes** capable of guaranteeing the energy self-sufficiency of the system
- Develop multi-level protocols ensuring **privacy** and **security** of the collected **data** considering the energy availability





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