



## BUTLER

uBiquitous, secUre internet-of-things with  
Location and contExt-awaReness

Through the BUTLER project, University of Luxembourg  
has benefited from European research funding.

### Towards a secured Internet of Things

**1** In the future, communication will no longer happen only between people, but will also take place between home appliances, cars, buildings or more generally any communicative device equipped with sensors and actuators. In 2020, this “Internet of Things” is expected to enable the exchange of information between billions of smart objects. The aim of the BUTLER project was to enable a network of intelligent objects to support people in their private and working lives.

The Internet of Things offers a wide range of opportunities for new products and services. At the same time, scientists need to consider new technical challenges, for instance related to the low power consumption, limited internal memory and narrow wireless communication range of some of the devices used. A key priority is also to find ways of ensuring the interoperability of devices and the privacy, security and reliability of data exchange over the Internet. The large number of low-cost embedded devices involved and the variety of specific network protocols used need to be taken into account.

The goal of the BUTLER project was to design and demonstrate a secured context-aware information system, which would operate transparently and seamlessly to create a unified “smart life” environment for Internet of Things users. BUTLER brought together a consortium of 19 partners – innovative companies, research and academic institutions, end-user centric service providers and business experts – from eight European countries: Belgium, Finland, France, Germany, Italy, Luxembourg, Spain and Switzerland. The Interdisciplinary Centre for Security, Reliability and Trust (SnT) of the University of Luxembourg participated through its NetLab team headed by Professor Dr Thomas Engel to build the necessary foundations for securing the Internet of Things.

BUTLER focused on five “innovation eco-systems” that are part of most people’s daily lives:

- smart homes and offices;
- smart shopping;
- smart mobility and transport;
- smart healthcare and wellness; and
- smart cities.

#### A BUTLER for smarter homes and offices

The SnT’s IoT Lab, which was created during the BUTLER project, provided several examples of Internet of Things network architectures and use cases.

In the smart home/office domain, for instance, ambient intelligence is used to improve the quality of life of inhabitants, bringing together applications from the areas of energy efficiency, ambient assisted living and human-building interaction. The IoT Lab designed a complete network architecture based on 6LoWPAN (IPv6 over Low Power Wireless Personal Area Networks) technologies dedicated to temperature monitoring. This research “space” is now used by researchers to make additional experiments on the IoT, such as security, routing, traffic analysis, scheduling, interoperability and IPv6.

#### Security expertise from Luxembourg

The BUTLER services are based on state-of-the-art network communication protocols that enable reliable communication using secured protocols that are adapted to the limited capacity of the devices that are part of the network. The researchers involved used context information to develop algorithms to improve trust, security and privacy that satisfy the needs of both users and infrastructure providers. The main achievement of the BUTLER project is the release of an open-platform portal that provides a map of open technologies that can be used to create Internet of Things applications. The platform can also be used to document their interoperability, relationships, and reference to existing use cases, infrastructures and deployments.

The SnT team contributed to this development with its expertise in security and privacy handling in innovation eco-systems. The contribution involved investigating trust, privacy and security at lower layers (physical devices and networks) in order to defend and protect the confidentiality, integrity and availability of data with lightweight cryptography. They also studied these issues at upper layers (e.g. applications).

The participation in the BUTLER project gave the University of Luxembourg the opportunity to establish cooperations that set the scene for further innovative and promising EU projects.



The Seventh European Framework Programme for Research and Technological Development (FP7) was the European Union’s main financial instrument to support European research during the 2007-2013 period. The funding programme will continue under Horizon 2020, the Framework Programme for Research and Innovation, supporting a wide range of research domains with a budget of €79 billion (2014-2020).