Symbiosis of smart objects across IoT environments

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1st Open Call - Summary

The symbIoTe Consortium

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Introducing symbIoTe and its 1st Open Call

symbIoTe is an H2020 research and innovation project (member of the IoT-European Platforms Initiative) that addresses a challenging objective of creating an interoperable IoT ecosystem. symbIoTe will facilitate the cooperation of vertical IoT platforms, which are today typically offered as closed systems, to simplify the development of cross-domain and cross-platform IoT applications. Within the 1st Open Call, **symbIoTe is seeking for proposals from legal entities that are developing their own** proprietary **or open source solutions falling into the category of IoT platforms**, i.e., software solutions for managing heterogeneous IoT devices that can be exposed as IoT services[1].
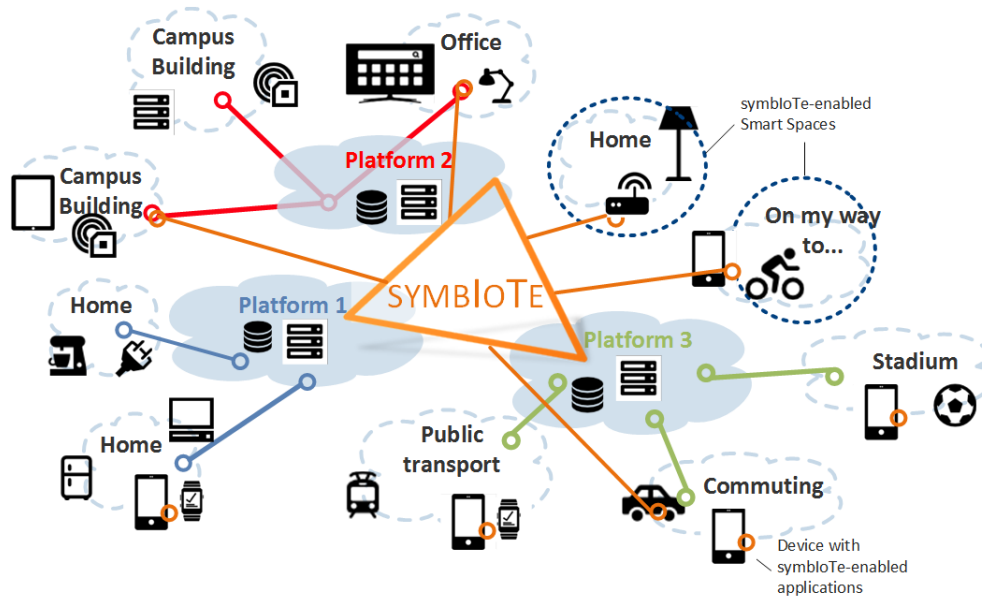
Why symbIoTe? The need for cross-domain IoT applications that can cover multiple aspects of everyday life is becoming more apparent nowadays. Therefore, in order to shape the future with more collaborative experiences, vertically isolated platforms need to be extended in order to cover other domains in which, however, the companies may not have the required expertise. Strategic partnerships are expected to be the only viable option. Moreover, the collocation of IoT platforms may result in resource inefficiencies, since similar sensors may happen to be deployed by different platforms at the same location. Furthermore, the burden of a single stakeholder deploying and managing the end-to-end infrastructure, from sensors and gateways to back-office servers and platforms, introduces a very high cost and skill barrier for new entrants to the IoT market which may, in turn, hold back the innovation opportunities for SMEs and start-ups. symbIoTe comes to remedy this fragmented environment by 'bridging IoT islands' with an abstraction layer for a 'unified view' on various platforms and their devices/services so that platform resources become transparent to application designers and developers.

Our Vision. symbIoTe is creating an *interoperability framework* to enable IoT platforms to open up access to their devices/services in a controlled and secure manner. It is not 'yet another IoT platform' as it is not designed to store any sensor-generated data, but rather a mediator storing only the metadata describing IoT devices/services which platforms

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[1] The terms 'IoT device' and 'IoT service' are used here in accordance with the AIOTI Domain Model, as defined in Murdock, P., Elloumi, O. (eds). AIOTI High Level Architecture. Release 2.1, 2016.

choose to expose to third parties. Thus, symbIoTe provides the required software infrastructure to search, recommend and provide access to adequate IoT devices/services to application developers.

Open platform interfaces come as a response to the emerging need for cross-domain IoT applications and services. By leveraging symbIoTe interfaces and software libraries, IoT platforms will be able to offer unified and secure access to their sensors and actuators. The devices remain under full control of platform developers and owners, who also define and manage access rights to their infrastructure. On the one hand, this will support application developers to rapidly create and deploy novel IoT applications without the need to own and operate the IoT infrastructure. On the other hand, IoT platform providers and infrastructure owners will be able to increase their user/developer base and create new revenue streams, since their infrastructure could be used in various new applications. This will create a vibrant IoT ecosystem with potential to create new business cases for existing IoT stakeholders.

Our Use Cases. symbIoTe use cases assist people seamlessly while performing their everyday activities, both indoor and outdoor. These environments can range from homes, offices and public spaces (e.g. campuses, stadiums or ports), to smart mobility solutions that assist travelers and commuters. The diversity of the considered environments is optimal to showcase platform interoperability, since it spans over a number of various IoT implementations, which are currently isolated and managed as closed systems. In contrast to the current situation, when a user has to use different applications at home, for public transport, at the university, etc., symbIoTe use cases will demonstrate a completely new type of applications built on top of interoperable platforms. The following use cases are developed within symbIoTe:

- *Smart residence* targets automatic discovery and configuration of devices in homes and offices.

- *Smart campus* develops "eduroam-like" IoT services for visiting students and staff to offer indoor navigation and room/equipment booking.

- *Smart stadium* uses indoor location platforms to be integrated with various context-based information services so that, e.g., visitors are guided to their seating places or closest available facilities, and provided with more information regarding their favorite football player.

- *Smart mobility and ecological urban routing* aims at addressing the problem of inefficient transport and poor air quality that many European cities face nowadays by tracking citizen exposure to pollutants and offering 'green' routes for bicyclists and pedestrians. In addition to in-situ stations, it uses wearable sensors and mobile devices for air quality monitoring.

- *Smart yachting* automates the exchange of information between a boat and the port, operated by two different platforms.

Details of symbIoTe's 1st Open Call. With this Open Call symbIoTe aims to enlarge the number of symbIoTe-enabled platforms that wish to become a tangible part of an evolving IoT ecosystem. We are seeking for legal entities that are developing their own or extending open source solutions falling into the category of IoT platforms. It is expected that an IoT platform joining the symbIoTe ecosystem can be used in domains relevant to

symbIoTe use cases, in particular Smart Residence/Office/Building/Campus and Smart Cities (including mobility and citizen involvement).

A selected applicant is expected to extend an existing IoT platform so as 1) to integrate an open interface defined by symbIoTe with the platform, 2) to integrate the symbIoTe solution for authentication and authorization with the platform and 3) to support registration of selected devices managed by the platform with external symbIoTe services. Note that a platform-specific information model needs to be aligned with the symbIoTe-specific information model during this process. In symbIoTe terms, the IoT platform will become Level 1 Compliant, as defined in symbIoTe 1st Open Call Technical Details. The applicant also needs to show potential to deploy the developed solution so as to open up access to a selected subset of IoT devices under applicant's administrative control to the symbIoTe ecosystem. The applicant's ability to test symbIoTe services in real life settings will be considered an asset.

The symbIoTe consortium will provide the definition of platform interface together with a Java library providing an implementation of this interface as well as an SDK to ease the process of integrating symbIoTe components with existing platform implementations. The symbIoTe consortium will also provide support and guidance during the learning, design and integration phases. The symbIoTe consortium is developing open source software using a business-friendly license so that proprietary IoT platforms which are symbIoTe-enabled remain closed.