Electricité de France R&D   Novembre 2023
Département ICAME
7 bd Gaspard Monge
91120 PALAISEAU

Proposition de stage de fin d'études 2023-2024
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Semantic modeling and co-simulation for
Multi-tenant IoT-enhanced Buildings

Descriptif

Multi-tenant buildings are typically large and privately owned buildings in which office space (building regions) is rented out to multiple organizations (tenants) [1, 2]. Current deployed Building Management Systems (BMS) and Internet of Things (IoT) devices may belong to either building owners or tenants. Typically, thermal comfort and indoor air quality is ensured via a heating, ventilation, and air conditioning (HVAC) system that belongs to building owners. On the other hand, a zero waste management and recycling system may be deployed from one or more tenants using their own IoT devices. Tenant-based IoT applications can usually be exploited only from members of the corresponding tenant(s) while building-based IoT applications could be exploited from all - or a subset of - building inhabitants depending on the access rights [3, 4].

The goal of this internship is to contribute to an approach of supporting the deployment of both tenant/building-based IoT applications in multi-tenant smart buildings. Fair data exchange techniques will be introduced based on budget/privacy constraints, as well as thermal comfort preferences of Tenants. Energy consumption of buildings and trajectories of tenants will be simulated using well-know Digital Twin tools [5,6].

[1] T. Edwards and W. Kumphai. Sustainability in multi-tenant office buildings: Anatomy of a leed ebom program. Energy Engineering, 109(2):7-23, 2012.
[2] L. Hartog, M. Weijs-Perree, and R. Appel-Meulenbroek. The influence of personality on user satisfaction: multi-tenant offices. Building Research & Information, 46(4):402-416, 2018.
[3] J. Koh et al. Who can access what, and when? understanding minimal access requirements of building applications. In 6th ACM Buildsys, pages 121-124, 2019.
[4] P. Pappachan et al. Towards privacy-aware smart buildings: Capturing, communicating, and enforcing privacy policies and preferences. In International Workshop on the Internet of Things Computing and Applications (IoTCA 2017) at the 37th ICDCS, page 6 pages, 2017.
[5] A. Chio, et al. SmartSPEC: A framework to generate customizable, semantics-based smart space datasets. PMC Journal & PerCom conference, 2023
[6] J. MA et al, DEMSA: a DT-enabled Middleware for Self-adaptive Smart Spaces, 1st Midd4DT (MIDDLEWARE) Workshop 2023.

Conditions matérielles

Encadrement :	Georgios BOULOUKAKIS (TSP) et Bruno TRAVERSON (EDF R&D).
Lieu du stage :	EDF R&D, 7 boulevard Gaspard Monge, 91120 Palaiseau.
Durée :	6 mois.
Rémunération :	(selon niveau d'étude) entre 1100 et 1400 € bruts / mois.
Connaissances requises :	Master 2 ou dernière année d'école d'ingénieurs, anglais, modélisation et programmation objet, système distribué, Semantic Web, Internet of Things.

Renseignements complémentaires

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