

architecture proposed can be extended with simulation services to generate full digitally twinned load tests that would generate impact at economy and productivity levels.

7 Acknowledgements

All authors acknowledge the funding of ASHVIN, “Assistants for Healthy, Safe, and Productive Virtual Construction Design, Operation & Maintenance using a Digital Twin” an H2020 project under agreement 958161. DEBES INCLUIR A LA AGAUR

References

- [1] Gha A., et al. Building Information Modelling (BIM) uptake: Clear benefits, understanding its implementation, risks, and challenges. *Renewable and Sustainable Energy Reviews*, 75: 1046–1053, 2017.
- [2] Gao X. and Pishdad-Bozorgi P. BIM-enabled facilities operation and maintenance: A review. *Advanced engineering informatics*, 39: 227-247, 2019.
- [3] Colakovi, A. Internet of Things (IoT): A review of enabling technologies, challenges, and open research issues. *Computer Networks*, 144: 17–39, 2018.
- [4] buildingSMART International, buildingSMART, <http://www.buildingsmart.org/>, Accessed: 7/02/2022
- [5] Borrman A. et al. The IFC-Bridge project—Extending the IFC standard to enable high-quality exchange of bridge information models. *En Proceedings of the 2019 European Conference on Computing in Construction*, pages 377-386 Chania, Greece. 2019
- [6] Desogus G. et al. Bim and iot sensors integration: A framework for consumption and indoor conditions data monitoring of existing buildings. *Sustainability*, 13(8): 4496, 2021.
- [7] Quinn C. et al. Building automation system-BIM integration using a linked data structure. *Automation in Construction*, 118: 103257, 2020.
- [8] Moretti N. et al. An openbim approach to iot integration with incomplete as-built data. *Applied Sciences*, 10(22): 8287, 2020.
- [9] Tang S. et al. A review of building information modeling (BIM) and the internet of things (IoT) devices integration: Present status and future trends. *Automation in Construction*, 101: 127-139, 2019.
- [10] Deng M. et al. From BIM to digital twins: A systematic review of the evolution of intelligent building representations in the AEC-FM industry. *Journal of Information Technology in Construction (ITcon)*, 26(5): 58-83, 2021.
- [11] Khriji S. et al. Design and implementation of a cloud-based event-driven architecture for real-time data processing in wireless sensor networks. *The Journal of Supercomputing*, 1-28, 2021.
- [12] IfcOpenshell. On-line: <http://ifcopenshell.org/>, Accessed: 22/02/2022
- [13] Van Rossum G., and Drake Jr F. L. Python reference manual. *Centrum voor Wiskunde en Informatica Amsterdam*. 1995.
- [14] Bezanson J et al. Julia: A fresh approach to numerical computing. *SIAM Review*, 59(1): 65–98, 2017.
- [15] Scholl S. Fourier, Gabor, Morlet or Wigner: Comparison of Time-Frequency Transforms. Signal processing Cornell University
- [16] Ghalishooyan M. and Shooshtari A. Operational modal analysis techniques and their theoretical and practical aspects: A comprehensive review and introduction. *6th International Operational Modal Analysis Conference IOMAC 2015*. 2015.