

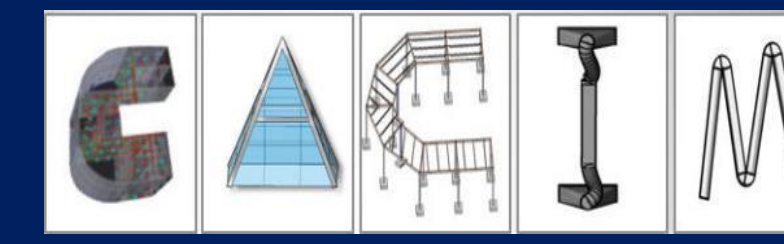


Application of Digital Twins in Building Operation and Maintenance



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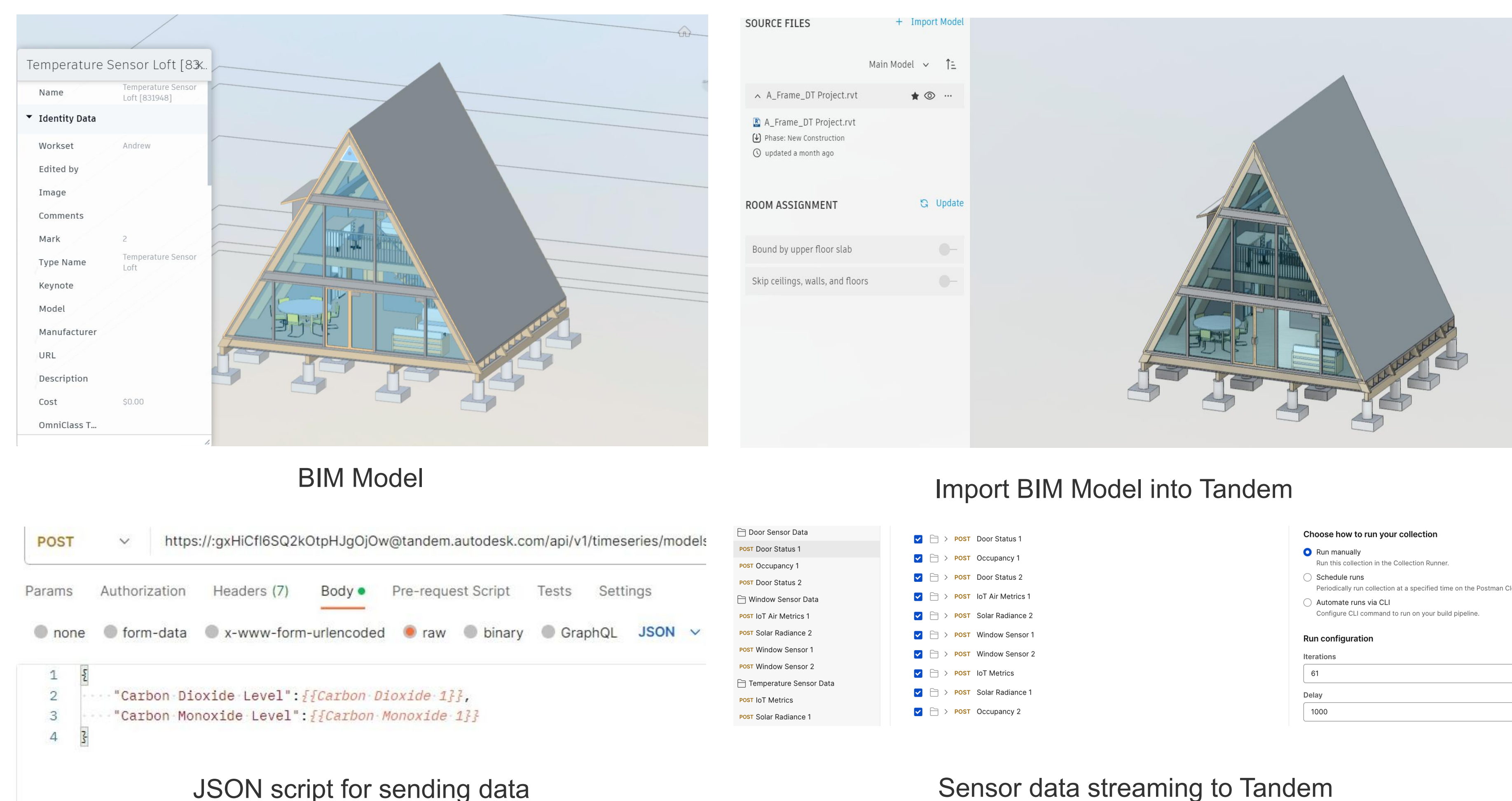
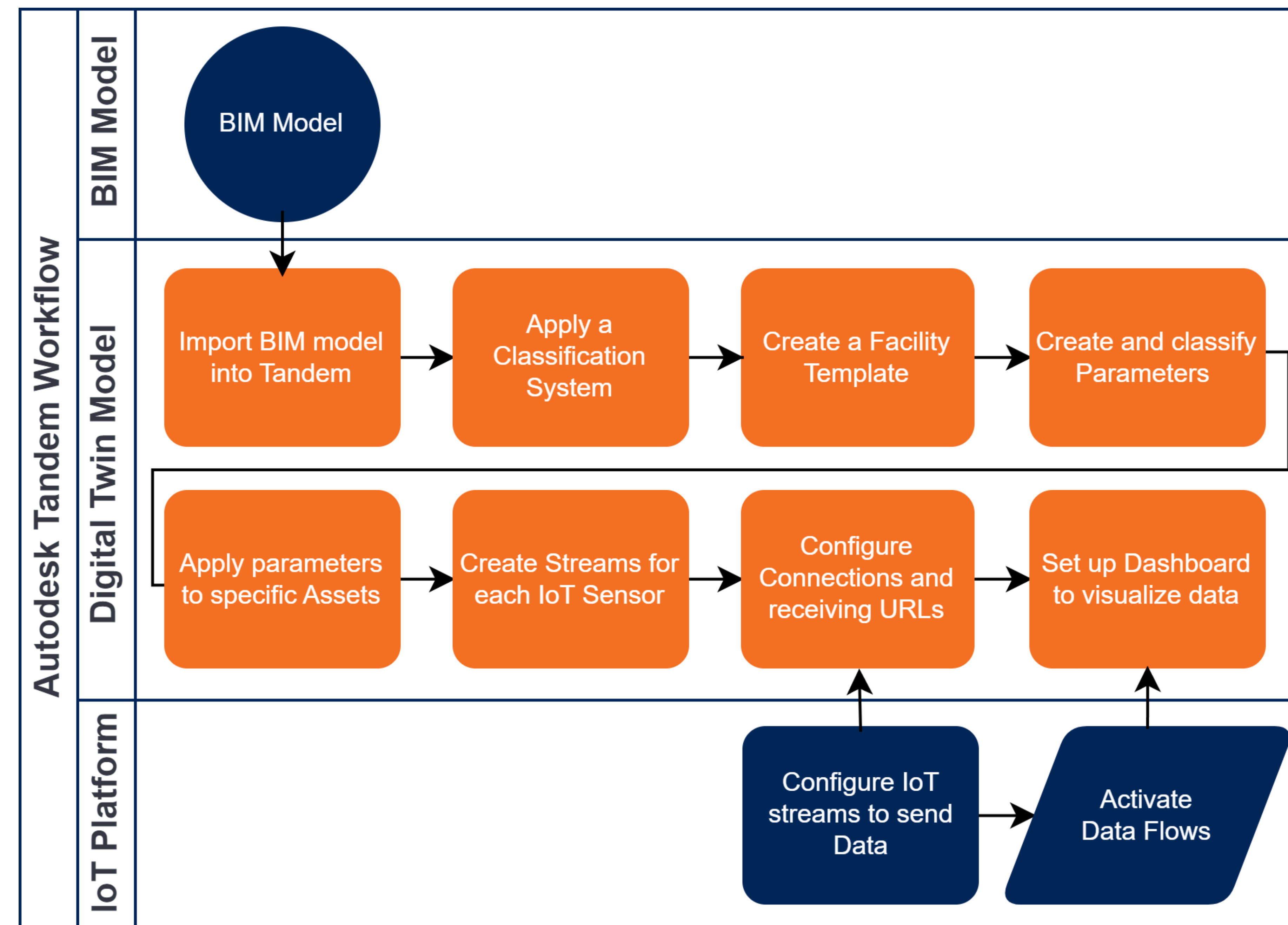
Background

- Digital Twin is defined as a digital replica of a real-world asset. (Segovia & Garcia-Alfaro, 2022)
- Digital Twins are quickly becoming synonymous with smart cities because they create the ability to interact virtually with all physical smart devices in built environment at all levels of the smart city.
- Digital Twins are expected to forecast and enhance system performance, which involves employing models and machine learning techniques, it becomes feasible to anticipate future system behaviors and enhance process efficiency. (Merino, et al., 2022)
- This discipline has become increasingly popular amongst building owners to monitor real-time data and get systems reports on their assets.

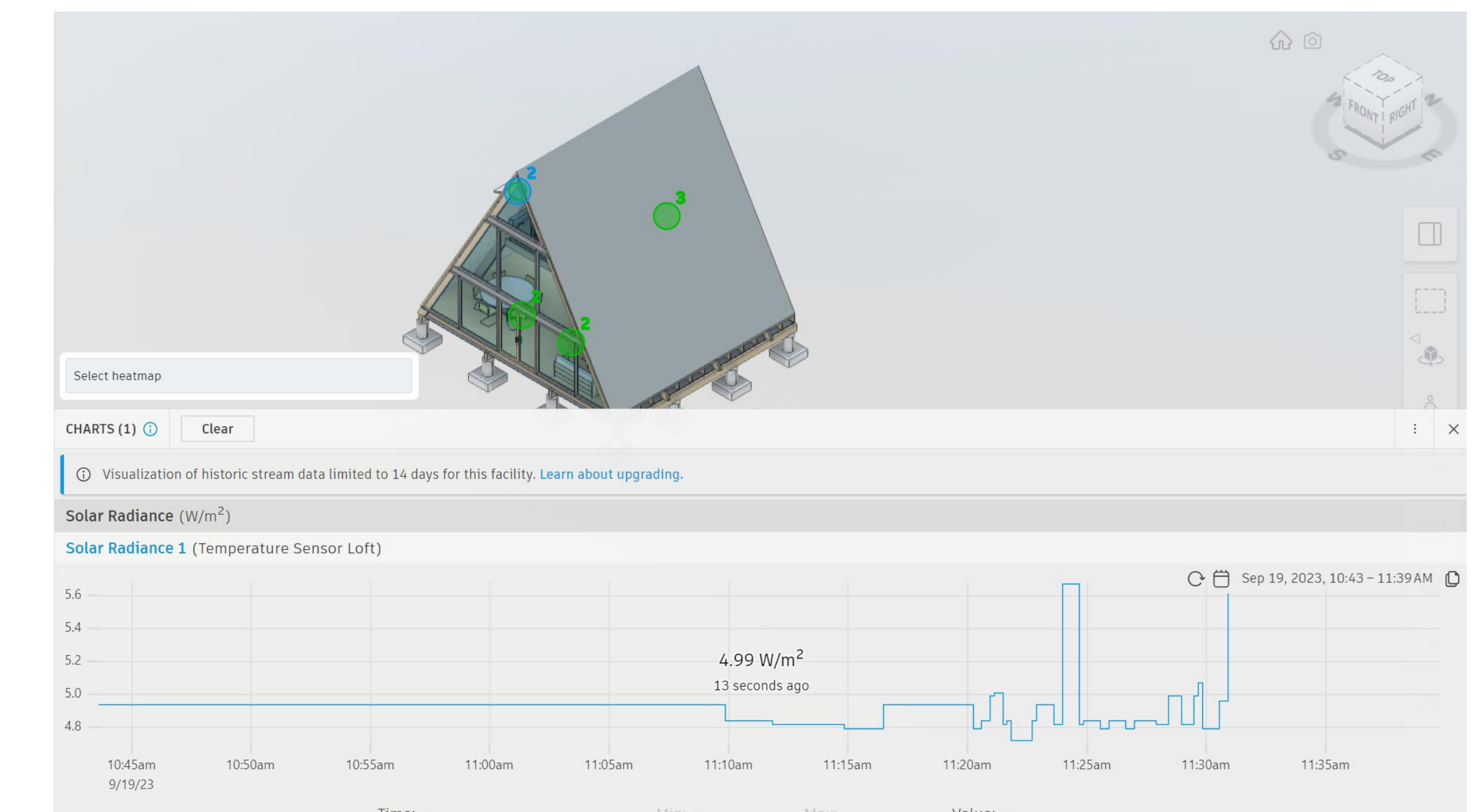
Objective

- Investigate the application of Digital Twins in Building Operation and Maintenance.
- Develop and test a comprehensive implementation workflow to transform a BIM model into a Digital Twin.
- Demonstrate the application of the proposed Digital Twin implementation workflow in buildings' energy efficiency and safety by monitoring key parameters in a building, such as occupancy, ambient temperature, and the status of windows and doors.

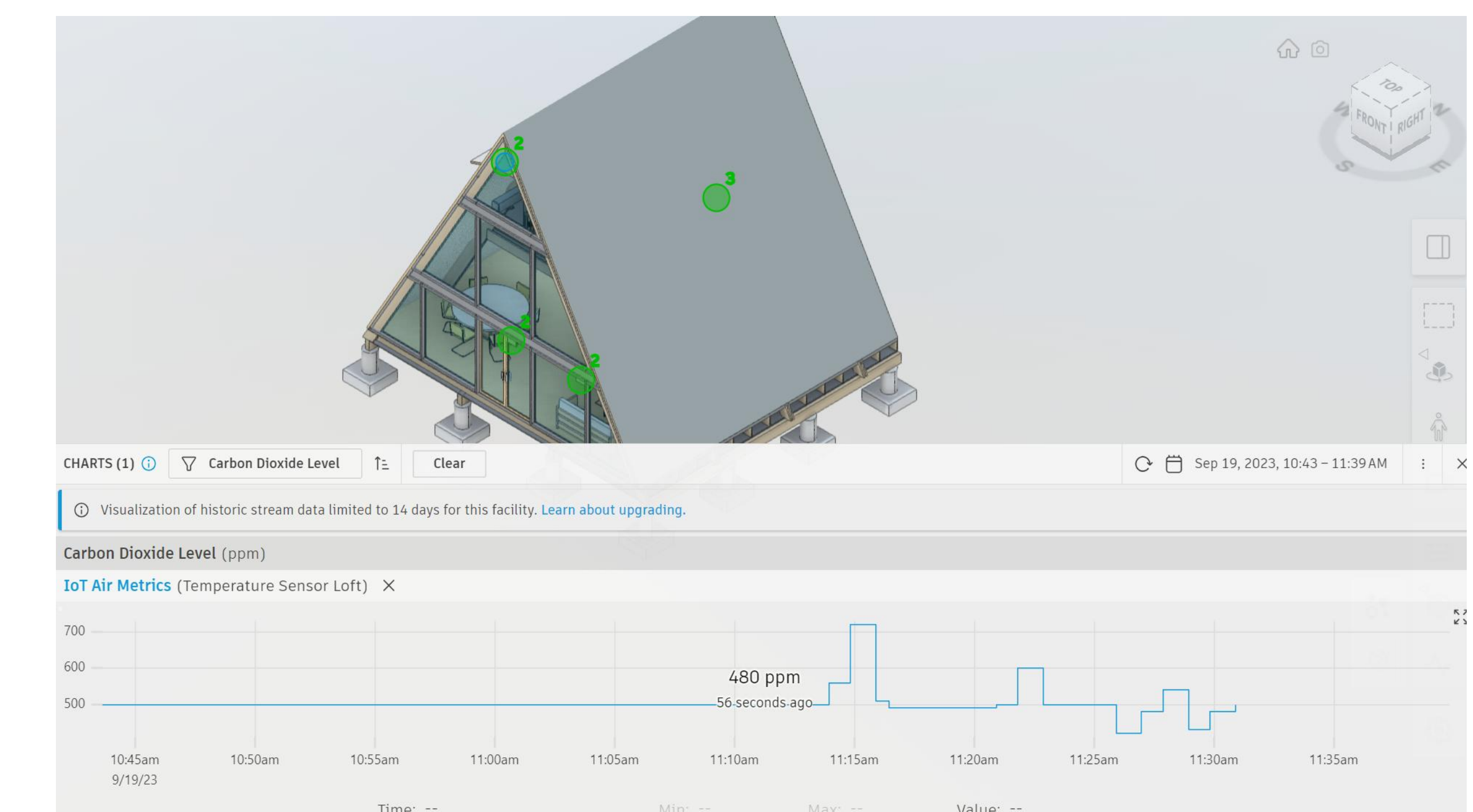
Implementation Workflow



Results



Real-time data stream for Solar Radiance



Real-time data stream for Carbon Dioxide level

Conclusion

Transforming BIM models into Digital Twins by integrating data from IoT devices presents an opportunity for enhancing facilities management. This innovative approach not only facilitates real-time monitoring of operational systems but also streamlines maintenance processes, making it a practical and efficient solution for facility management.

References

- Segovia, M.; Garcia-Alfaro, J. Design, Modeling and Implementation of Digital Twins. *Sensors* 2022, 22, 5396. <https://doi.org/10.3390/s22145396>
- Merino, J., Xie, X., Moretti, N., Chang, J., & Parlikad, A. K. (2022). Data integration for digital twins in the built environment. *Computing in Construction*. <https://doi.org/10.35490/ec3.2022.172>