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Conflicts management of users comfort preferences in a smart environment, a case of study

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INTRODUCTION & AIM

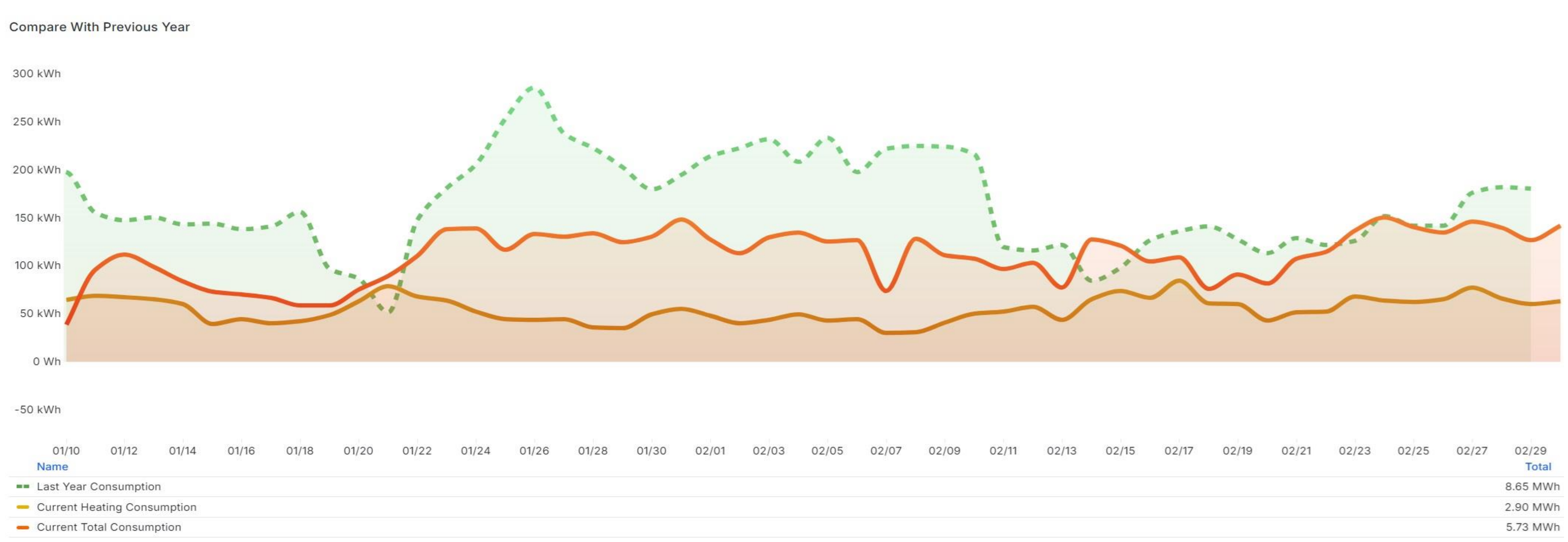
Residential buildings are excellent cases for utilizing intelligent climate control solutions. They typically consist of spaces used by individuals or small groups of people, where each individual/group is independent in terms of routines and comfort preferences. Often, these individual spaces are used solely for overnight stays, meaning they remain unoccupied for most of the time. Climatization systems that operate independently of actual space usage or user comfort preferences are highly inefficient for this kind of scenario. Additionally, residents usually pay based on the duration they stay in the residence (per day or month), without any direct allocation of costs related to climatization. This contributes to the residents' lack of responsibility in their use of the climatization, as they have no financial or environmental impact concerns. The authors report a case study conducted in a university residence for short-term stays intended for visiting professors and researchers. The experience was done aiming at the reduction of energy consumption with climatization. The solution ensures that individual space control is allowed according to each resident's preferences. This case study also posed challenges in assigning and maintaining access permissions to control the climatization system.

METHOD

The solution to be developed focused primarily on the control logic, but to implement this logic, it was necessary to have access to data such as the ambient temperature of each room or the detection of presence, particularly in individual-use spaces. On the other hand, it was necessary to have a way to control the climate equipment. To acheive this, each room was equipped with Shelly's sensors to get temperature and presence data, and Shelly's switches to turn on or off radiators. In another hand, a Server was developed using MQTT and Client-Server protocols to exchange data with residence remotely. Finally, in the Server, a logic control was implemented for each room, where using some conditions depending the temperatures and motion data achieved by sensors and different periods' day, allow us to get some different approaches for day and night periods.

RESULTS & DISCUSSION

Regarding energy consumption, existing data is still limited. They already demonstrate gains, but full validation requires a longer period of analysis, which allows validation of the system by reducing the influence of climate variations (between periods in comparison), as well as variations in behavior, comfort preferences and routines of the residents. As can be seen in the figure above, this year's consumption was almost always lower, and when this did not happen, the difference was not very significant. In periods in which there was a decrease in consumption, the difference is quite significant.



CONCLUSION

In conclusion, the implementation of intelligent climate control systems in university residences for temporary guests presents a promising solution to enhance comfort, improve energy efficiency, and reduce operational costs. From a functional and operational point of view, the solution created proved to be effective and capable of providing the necessary functionalities to residents. Residents continue to be able to define their comfort conditions as they did until now, but they no longer have any concerns about managing the system - everything happens automatically, even when less civic behavior is at stake.

FUTURE WORK / REFERENCES

Future work should analyze the use of artificial intelligence to estimate future needs, allowing for more timely action and ensuring even better comfort conditions. It is also pertinent to consider in the control logic the variation in energy costs throughout the day, as well as its origin (clean or polluting sources). But mainly validate the solution, including data from longer periods of time.