

# Small Building Controls Energy Management Success Story



## University of California Davis

The UC Davis Energy Team established a robust energy efficiency program for their large building HVAC systems, which included the application of best practice controls and analytics, but lacked a solution for the hundreds of smaller buildings on campus that did not have building automation systems. These smaller buildings, equipped with packaged HVAC units and controlled by stand-alone thermostats, offered no central visibility and every comfort call required a maintenance site visit. In 2019, the Energy Team set out to improve the management of these buildings on campus through an initiative they called Small Workplace Automation and Remote Monitoring (SWARM).

The SWARM initiative replaced traditional stand-alone thermostats with an internet-connected network of thermostats enabling centralized data monitoring and control through remote interfaces. This initiative gave the UC Davis Energy Team improved control over buildings that were previously disconnected with abilities such as remote adjustment of temperature setpoints, holiday schedules, occupancy modes, and the capability to participate in demand response events.

## Project SWARM Deployment

After conducting a successful pilot at three office buildings, the Energy Team expanded the SWARM initiative to 100 additional buildings over three years. For each building connected to the centralized network, the team conducted a site walk-through, presented the solution to the building occupants, installed a communication gateway, and configured the newly-installed thermostats. Each building was set up with efficient temperature setpoints and an HVAC schedule that aligned with occupancy patterns.

## Occupant Comfort and Solution Flexibility

While a primary goal of the SWARM initiative is to centrally control temperature setpoints and schedules, research shows that occupants feel more comfortable in their space when they have some level of control over temperature. A benefit of implementing the centralized control system is the flexibility to allow facilities teams to grant designated users access to change their space temperature setpoint through the mobile app or their workstation, when needed.

The facilities or energy team can then remotely reset these temporary changes back to optimal setpoints when there is no longer a need for them to continue, to promote long term energy efficiency.



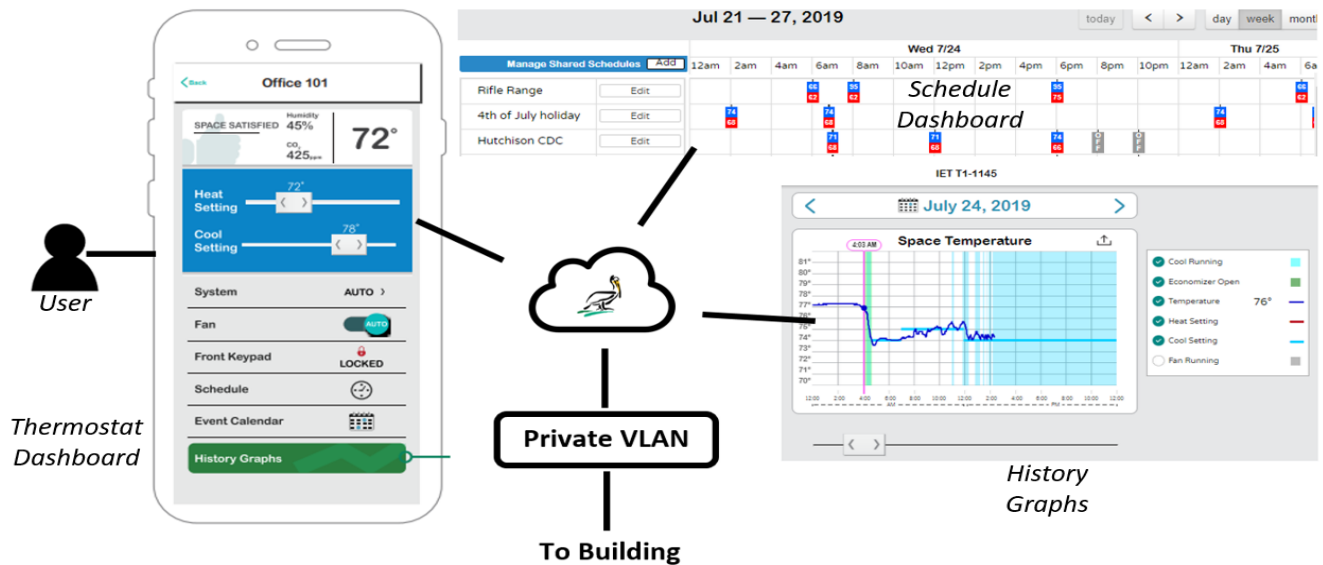
A participating UC Davis building

*“Small buildings on our campus were often uncomfortable when they were occupied, and wasted energy when they were empty. With SWARM, we have a solution that improves comfort, saves energy, and allows us to manage our small building portfolio, at scale.”*

*Nico Fauchier-Magnan,  
UC Davis Energy Engineer  
Supervisor*

Student Affairs Annex	
D088-T1-023 Tstat in rm 23 Heat Setting 68°	72°
D088-T2-027 Tstat in rm 27 Cool Setting 74°	73°
D088-T3-023 Tstat in rm 23 (1 of Heat Setting 68°	72°
D088-T4-023A T-stat in rm 23A Fan Running Setting 85°	73°
D088-T5-015 t-stat in hallway Fan Running Setting 55°	67°

Mobile access to HVAC settings allows for easier troubleshooting



Centralized control dashboards enable remote management of schedules and temperature setpoints in small buildings (left: single thermostat settings, top: scheduling dashboard, right: historical graphs)

## Reaping the Rewards

UC Davis selected eight buildings for detailed measurement & verification and saw a median 28% whole building energy savings. Based on these results, the SWARM initiative is estimated to save \$80,000 per year in energy costs across 100 buildings. The total investment in the project is estimated at \$200,000 including labor and materials (roughly \$2,000 per building), resulting in a simple payback period of under 3 years for this project.

While energy savings varied significantly between the buildings studied, the SWARM initiative allows the Energy Team to ensure continued energy efficiency and occupant comfort in all buildings.

Buildings with the most significant reduction in energy use were running the HVAC system 24/7 with no scheduling or setbacks prior to the initiative. In addition to energy savings, the initiative reduces equipment wear and tear by minimizing total run time with more efficient scheduling.

The centralized control system has also enabled participation in demand response programs. The energy team can easily adjust thermostat setpoints across selected buildings during a demand response event.

## Moving Forward

Project SWARM has transformed UC Davis' ability to manage their small buildings and allows them to continually maintain efficient energy use and occupant comfort. Not only does this reap significant energy savings, it also provides a platform for adding enhanced control and demand response capabilities across the whole portfolio.

### Quick Facts

Controls Provider:	Pelican
Project Location:	UC Davis
Building Type:	Office, childcare center, lab
Average Building Size:	5,000 ft <sup>2</sup>
Total buildings with controls solution:	101
Median energy saved:	28% whole building

The Smarter Small Buildings Campaign is a program sponsored by the US Department of Energy to promote the implementation of enhanced controls and monitoring for small and medium commercial buildings. The Campaign accelerates improved HVAC to advance comfort and savings for through technical assistance, best practice resources, and peer exchange. Find out more at [SmarterSmallBuildings.lbl.gov](http://SmarterSmallBuildings.lbl.gov)