

HVAC Controls Gamification

Harris Integrated Solutions



PROBLEM STATEMENT

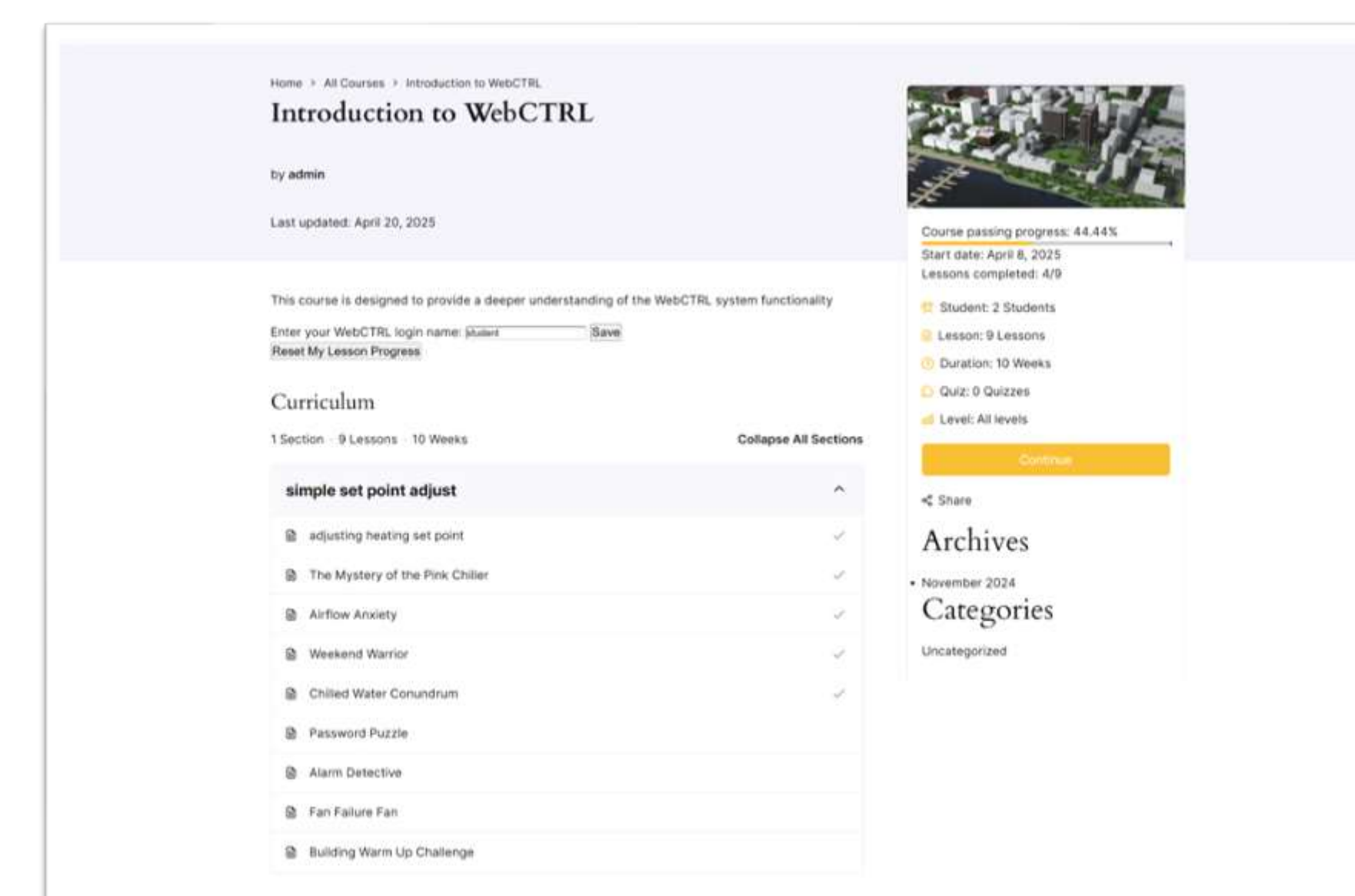
- **Background:** Efficient HVAC operation is essential for comfort and energy savings. However, users often lack awareness or motivation to optimize their settings.
- **Problem Statement:** To address energy waste and user disengagement, we created a gamified HVAC control system that uses interactive challenges and rewards to promote efficient HVAC usage.
- **Objectives:**
 - Increase user engagement through interactive platform.
 - Teach energy-saving HVAC practices using gamified elements.
 - Provide educational content to raise awareness of HVAC system impact and conservation strategies.

REQUIREMENTS

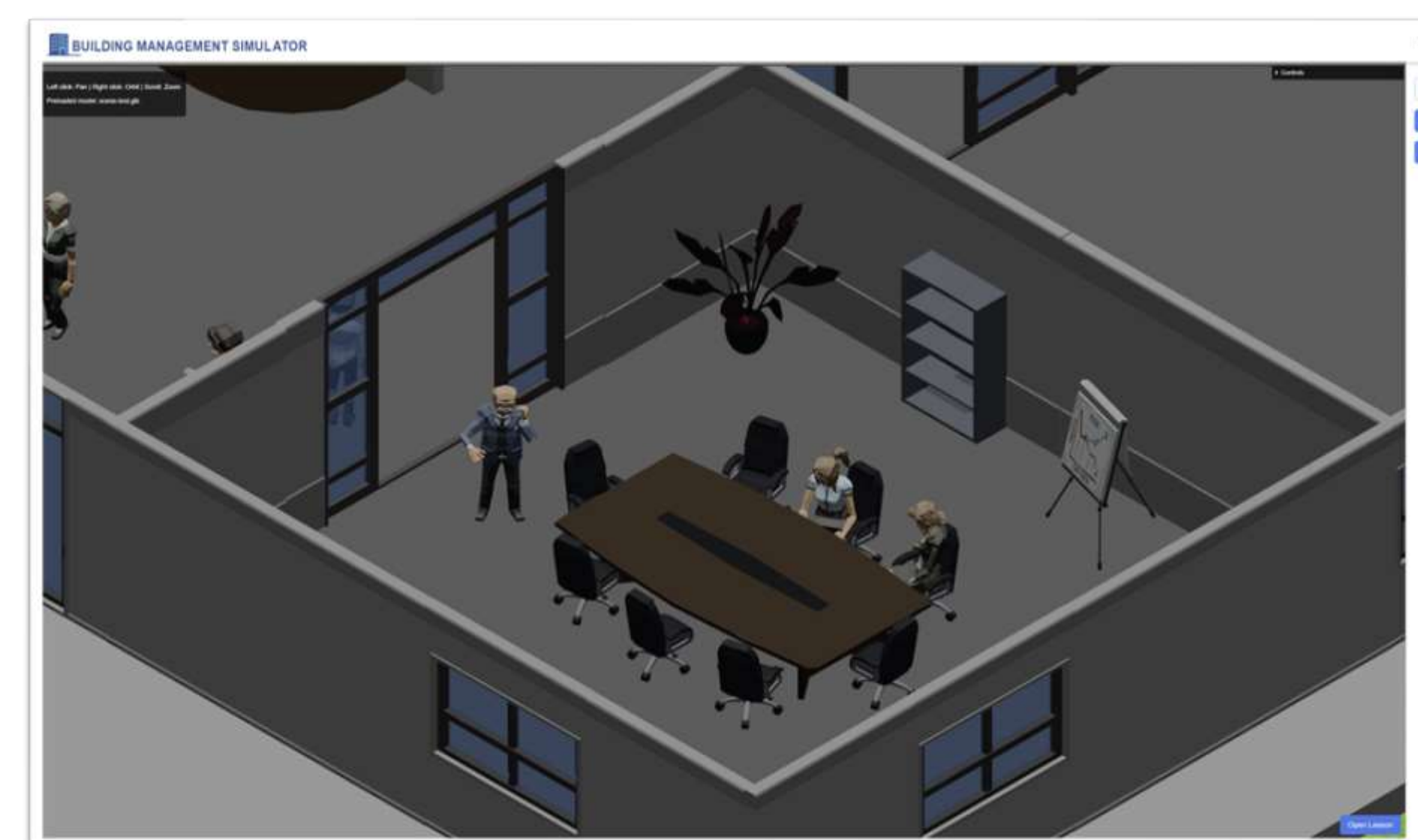
Requirement	Description
User Interface (UI)	Intuitive, accessible via web or mobile; includes visual HVAC system diagrams
Gamification Features	Points, badges, challenges, quizzes, and leaderboards to motivate interaction
Energy Monitoring	Real-time feedback on energy usage and HVAC performance
Educational Content	Tutorials and tooltips explaining HVAC concepts and efficiency techniques
Scheduling Controls	Ability to edit, override, and visualize occupancy schedules

FINAL DESIGN AND APPROACH

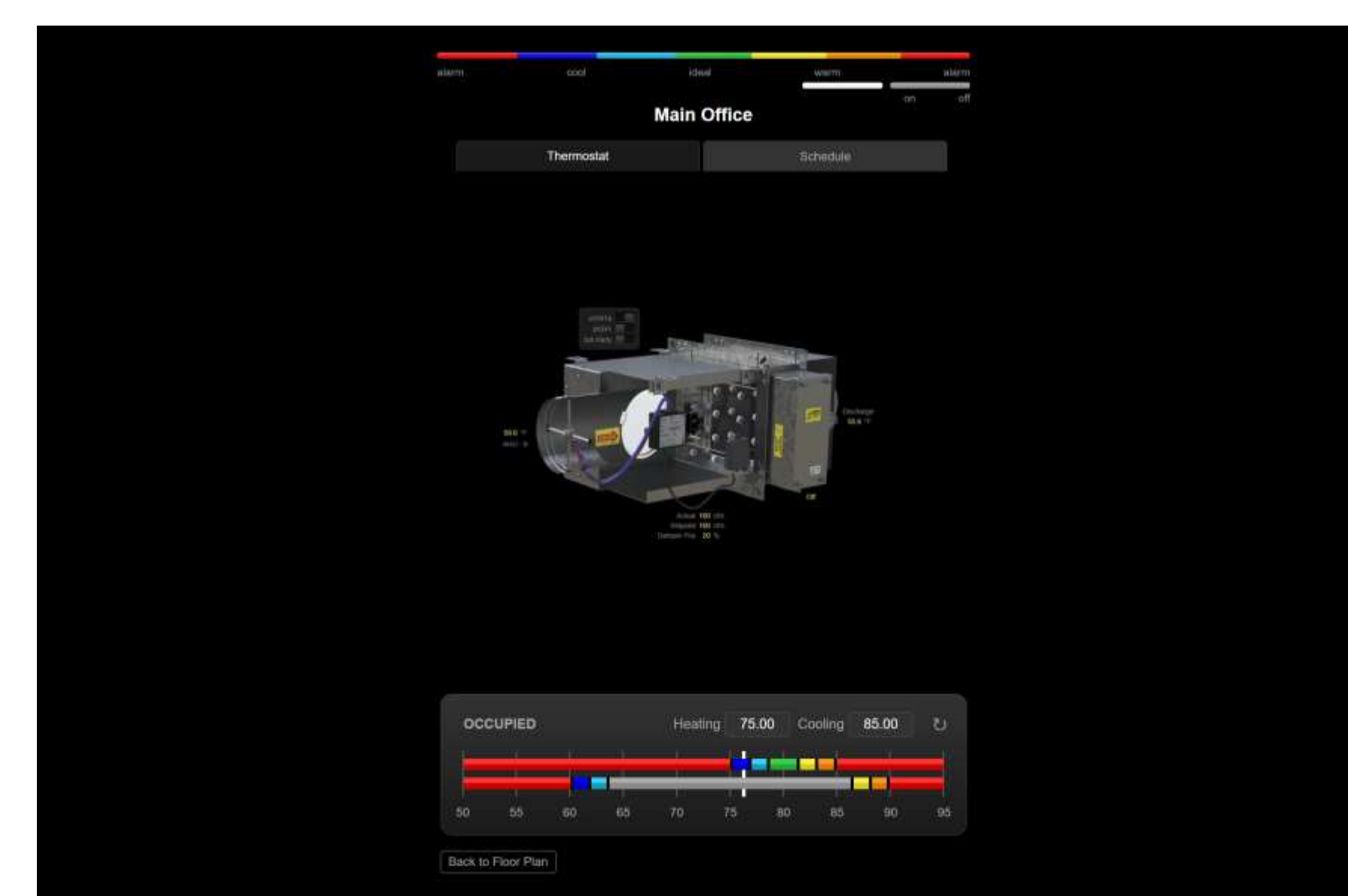
The final design consists of a web-based gamified platform that enables users to interact with HVAC and building management related lessons and challenge. The users go through a process of learning through lessons, practicing in a simulator, and applying core concepts directly on their system to receive feedback and rewards.



Front page of a website module with different lessons.



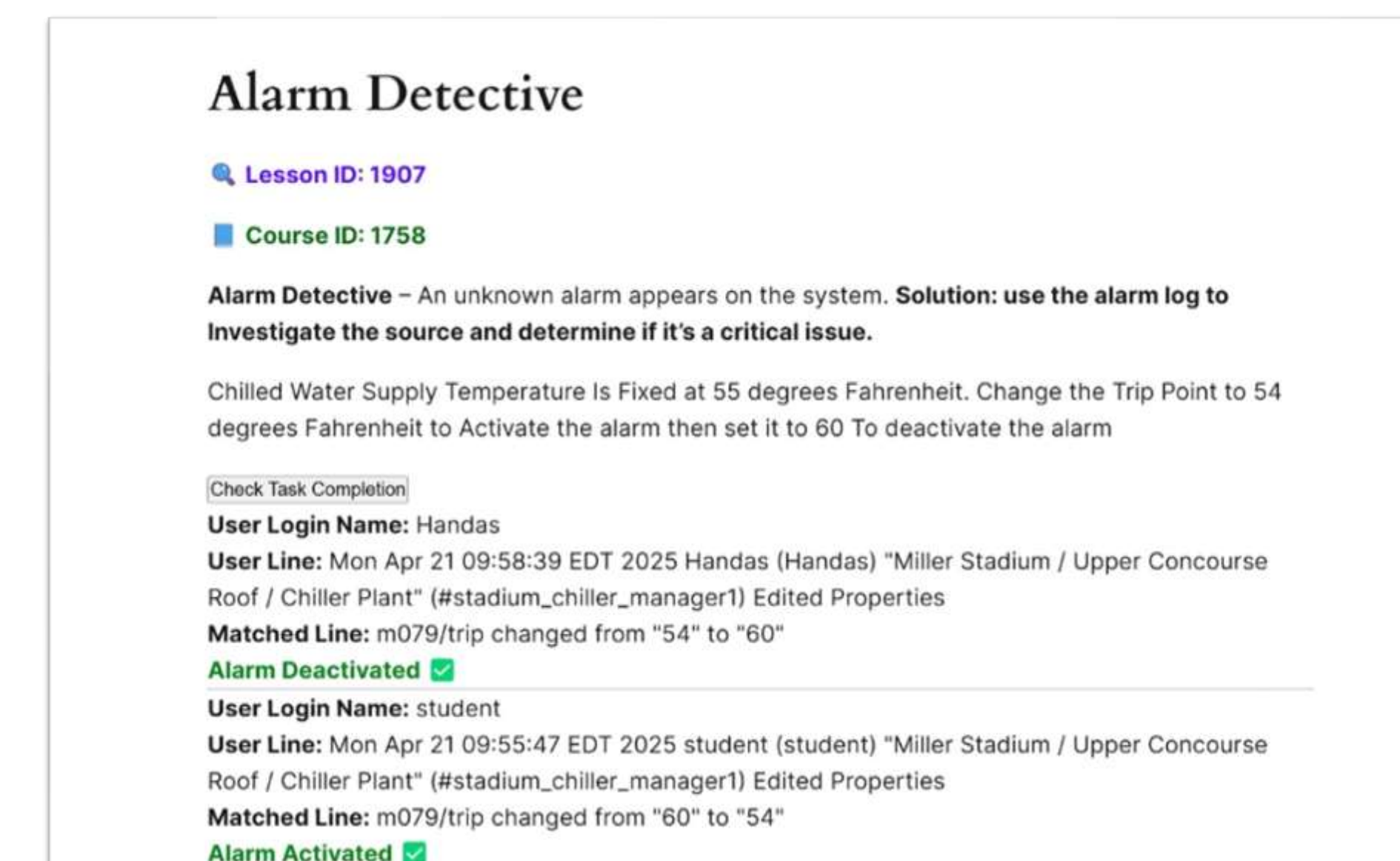
Example of the environment in the building management simulator.



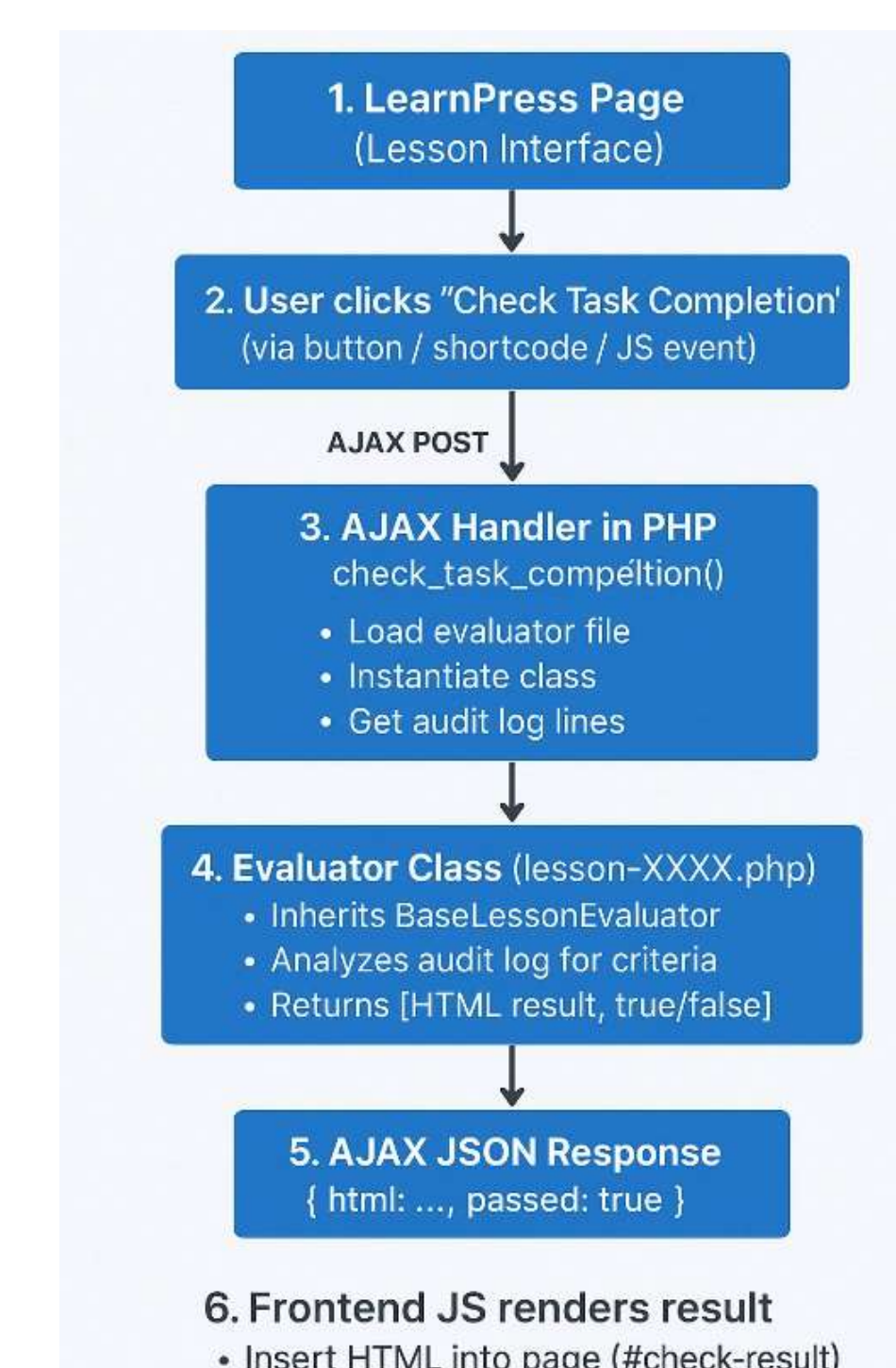
Example of the simulated user controls.

RESULTS

- Developed a fully functional, web-based HVAC gamification platform.
- Implemented lesson modules, simulation environments, and feedback loops.
- Users can complete challenges, monitor real-time HVAC data, and receive rewards based on efficiency.
- Early user testing showed improved understanding of scheduling, efficiency, and environmental impact.
- System successfully simulates building management logic using real-world HVAC scenarios.



Example of the system handling user interactions.



Workflow of user interaction handling

SUMMARY AND CONCLUSIONS

The HVAC gamification platform combines education, simulation, and incentives to promote energy-efficient behavior. By integrating tutorials, real-time monitoring, and interactive controls, the system supports users in understanding and managing HVAC systems effectively. The gamified structure motivates ongoing participation, while performance feedback helps reinforce learning. Initial testing indicates strong potential for energy savings and user engagement through this interactive training approach.

FUTURE WORK

There is potential to continue developing the platform to expand the scope and methods.

- Incorporate adaptive learning paths based on user behavior and performance.
- Enable multi-user competitions and real-time collaboration for broader engagement.
- Integrate with Automated Logic's full WebCTRL suite for live data testing.
- Conduct long-term studies to measure behavior change and energy savings across real facilities.

TEAM & ACKNOWLEDGEMENTS

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