

Advanced Sauna Control & UI

Personal Project

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Overview

I designed and built a sophisticated user interface for a sauna, fully integrated with an existing KNX system to enhance user experience and control. The interface features essential functionalities such as a start delay, session timer with visual countdown bars, temperature control, and a comprehensive temperature over time graph, providing an intuitive overview of sauna conditions.

System Architecture

The system is powered by an ESP32 microcontroller, flashed with ESPHome firmware to facilitate over-the-air updates and heartbeat status monitoring. This enables real-time tracking of the microcontroller's status and uptime, ensuring reliable operation. The ESP32 is configured to take temperature readings through a rolling average combined with a digital low-pass filter. This smooths out fluctuations in temperature, ensuring that the data sent to the central Home Assistant instance is both stable and accurate.

Data & Control Logic

Temperature data is transmitted via Wi-Fi to a central Home Assistant setup running on an older Surface Pro, providing a central hub for control and monitoring. To manage control logic, I employed Node-RED, a flow-based programming tool that allows for seamless integration with the existing KNX system, not having to reinvent the wheel. Node-RED's safety features are a key component of this setup; uptime and downtime routines, along with crash handling protocols to ensure system stability and reliability.



Remote Access

Additionally, the system leverages ZeroTier, a virtual networking solution that allows for remote access to the sauna control interface from anywhere in the world. This capability means users can set the sauna to preheat or adjust settings without needing to be connected to the local Wi-Fi network. By connecting through ZeroTier, the system establishes a secure virtual network, maintaining robust connectivity and ensuring that users can monitor and control their sauna remotely.

Conclusion

Overall, this project not only modernizes sauna operation but also demonstrates the potential of integrating smart home technologies for enhanced user control and convenience. The combination of ESP32, Node-RED, Home Assistant and ZeroTier exemplifies a powerful approach to home automation, providing a comprehensive solution for a smart home connection.



