Overview

A home energy management system is required to coordinate household appliances usage and distributed renewable energy resource and storage.

Hardware Setup

- HEM System
  - System inputs: power measurements and environment information
  - Communication method: ZigBee and Message Queue Telemetry Transport (MQTT)

- Arduino based Load Agent
  - Smart Power Meter
  - Data Receiver and Sender
  - Local Controller

Results

- To implement the HEM system, a cost-effective and user-friendly hardware test system is designed and implemented.

Fig. 1 A Layout of the Physical Hybrid Smart Home Test System at FREEDM System Center.

Fig. 2 The Architecture for HEMS Test System

Fig. 3 Physical Approach for HEMS

Fig. 4 Load Agent Setup for HEMS System Testbed

Fig. 5 HEMS testbed in FREEDM System Center

Fig. 6 Main interface of HEMS simulation GUI

Conclusion

- This research aims to develop a practical home energy management system with the main objective to minimize residential customers' electricity bill.
- The hardware system consists of a locally centralized energy management unit (EMU), smart switch for each appliance and a ZigBee based home area communication network.
- A novel design of hybrid controller is proposed, which allow the HEMS to control house appliance with minimum delay and taking the user comfortableness into account.
- The software design considerations are presented, which consist of a user interface, load modeling, load forecasting and load scheduling.

References


Partners