1. System Architecture :

This project follows the industry-standard four-layer IoT model:

- Physical Layer (Wokwi): Simulated ESP32 and DHT22 sensor representing the physical environment.

- Communication Layer (MQTT): Uses the broker.hivemq.com public broker to transmit data as JSON payloads.

- Digital Twin Layer (Node-RED): The logic engine that processes raw data into insights like "Comfort Status".

- Application Layer (Dashboard): A visual UI providing real-time gauges and historical trend analysis.

2. Hardware Wiring (Virtual) :

Component	ESP32 Pin	Connection
DHT22 (SDA)	GPIO 15	Data Input
AC LED (Anode)	GPIO 2	Actuator Output
VCC / GND	3.3V / GND	Power Rail

3. Core Logic & Thresholds :

The Digital Twin operates on a **Closed-Loop Feedback** system:

- Monitoring: Updates every 2 seconds.
- Threshold: If $Temp > 30°C$, the "Twin" state shifts to "STUFFY" and triggers the AC.
- Manual Override: The Twin allows remote "OFF" commands via the .../control topic.