ESP32 MQTT Relay Switch Guide

1. Overview
Use an ESP32 and SRD-05VDC-SL-C relay module to toggle a device through MQTT.
The ESP32 listens on smarthome/relay1/cmd and reports status to smarthome/relay1/status.

2. Bill of Materials
ESP32 DevKit with 3.3 V logic.
SRD-05VDC-SL-C relay board with driver or optocoupler input.
5 V relay supply plus USB power for the ESP32 and a shared ground.
MQTT broker such as Mosquitto running on your computer, Pi, or cloud VM.
USB cable, Dupont wires, safe enclosure, and the load you plan to control.

3. Wiring
ESP32 5V (VIN) to relay VCC or external 5 V output.
ESP32 GND to relay GND to keep signal reference common.
ESP32 GPIO23 (example) to relay IN; adjust pin in firmware if needed.
Relay COM in series with mains live feed, NO to the device live input, neutral remains direct.
Confirm whether the relay board is active-low or active-high before flashing firmware.
Keep mains wiring isolated, add a fuse, and secure everything in an enclosure.

4. MQTT Topics and Payloads
Command topic: smarthome/relay1/cmd with payloads ON, OFF, or TOGGLE.
Status topic: smarthome/relay1/status with payloads ON, OFF, or ERR.
Use retained messages if you want late listeners to know the last state.

5. System Flow
Boot: ESP32 connects to Wi-Fi then authenticates with the MQTT broker.
It subscribes to the command topic and waits for payloads.
When a valid command arrives it drives the relay pin and publishes the new state.
Invalid payloads trigger an error status message so operators can react.

6. Broker Setup
Install and start Mosquitto with: mosquitto -v -c mosquitto.conf.
Open TCP port 1883 on the host firewall and forward it if you need remote access.
Enable username and password or TLS and copy the credentials into the sketch.

7. Testing
Publish: mosquitto_pub -h <broker_ip> -t smarthome/relay1/cmd -m ON.
Subscribe: mosquitto_sub -h <broker_ip> -t smarthome/relay1/status.
Listen for the relay click and verify the controlled device switches correctly.

8. Safety
Mains voltage is hazardous; keep relay boards and wiring in closed enclosures.
Use proper gauge wires, add strain relief, and never touch live terminals.
Consider adding a snubber or MOV across inductive loads to protect the relay.

9. Troubleshooting
No Wi-Fi: double-check SSID and password and stay on 2.4 GHz networks.