



Specification

Rev 0.1

Version 0

MQTT Light Switch

Executive Summary:

Retail a true Power Over Ethernet 1, 2, 3, and 4 button light switch that communicates via MQTT and can be integrated by Denton DBI as well as common home automation platforms like Home Assistant. The product will service commercial PoE lighting companies as well as DIY home automation enthusiasts.

Features:

Hardware:

- Shall provide 1, 2, 3, and 4 momentary push buttons



- Buttons shall include some hardware debounce capacitance
- LED indicator lights shall indicate when the button is being pushed
 - Future development: Allow for MQTT setting of the status of the LED lights
 - On boot up, LED lights will blink until IP address is confirmed on DHCP and receives first acknowledgement from MQTT server or Matter
- Shall fit in a single gang box



- Shall run on IEEE 802.3at PoE (12 watts)
- Does not require wireless or bluetooth communication
- Shall communicate through ethernet
- Shall include a hidden button to allow for resetting to factory defaults

Software Features:

- Microcontroller target: ESP32-C6-WROOM-1-N8
- Mongoose Web Server
- W5500 Ethernet interface
- Use ESP internal EEPROM for persistent data settings
- Reference "SCH_MQTT POE V5_2024-07-01.pdf" for IO pinouts
- SW5 "Restore factory settings" button will overwrite all persistent data settings with hardcoded defaults
- Ethernet will use DHCP by default
- Shall have a simple web interface for configuring the MQTT server
 - Includes an option to do TLS encryption
- MQTT Payload definition:
 - Ensure it complies with Home Assistant standards for a switch
 - <https://www.home-assistant.io/integrations/switch.mqtt/>
- Web interface features:
 - Display the current status of the buttons
 - Network Management:
 - Selector for changing DHCP on/off (persistent data, default: on)
 - Text field for changing "Static IP Address" (persistent data, default: "192.168.10.18")
 - Set and save static IP address (persistent data, default: DHCP)
 - Text field for changing "Default Gateway" (persistent data, default: "192.168.0.1")
 - Text field for changing "Subnet Mask" (persistent data, default: "255.255.255.0")

- MQTT Management
 - Text field for changing "MQTT Server URL" (persistent data, default: "http://172.25.129.148:8883/")
 - Text field for changing "Subscribe to Topic" (persistent data, default: "{device_id}/rx")
- Disable buttons SW1, SW2, SW3, SW4 individually (persistent data, default: all enabled)
- Log the last 100 MQTT in/out messages and display in list (not persistent). Mongoose for save to file implementation.
- Change password for login (persistent data, default: "admin")
- Firmware update through Mongoose OTA implementation (no download of firmware; only upload)
- Text field for "Device Name" and display on web interface once set (persistent data, default: "MQTT Switch")
- Text field for "Device Location" and display on web interface once set (persistent data, default: "Austin, TX")
- Display clock through Mongoose time sync implementation
- Matter and Thread
 - Shall incorporate the ESP Matter and Thread SDK's to allow configuration on Matter and Thread as switching devices
- Shall include a hardware self test after program upload and a test
 - Bring up each light
 - Test noise on inputs
 - Accept inputs on each button
 - Sends a log to an MQTT broker with results

Execution:

Design Basis:

- The board shall be designed around the ESP32C6 to provide sufficient memory to hold the local web server

See schematics

- Mongoose is embedded web server.

<https://github.com/cesanta/mongoose>

Functional Testing Requirements:

- Boot and Configuration
 - Boots and starts up within 30 seconds of power on
 - Boots to blink LED lights until IP address is confirmed and received first response from MQTT server (if configured) or Matter (if configured)
 - Boots to DHCP over ethernet by default
 - There is an external button that will reset the light switch to factory defaults if pressed and held for 10 seconds
 - LED lights begin to blink rapidly
 - Allows for Wifi broadcast configuration for Matter, but will default to communication over ethernet unless ethernet is disabled
 - Either through WiFi or Ethernet, the user can access the webui to configure the device.
 - Username: admin
 - Password: litemeup
 - Configuration settings
 - MQTT settings
 - DHCP vs Static IP address, with subnet mask
 - 1, 2, 3, or 4 buttons enabled
 - Please refer to WebUI
- Function testing
 - Press 1 button:
 - Sends Matter push button signal for a momentary switch
 - Send MQTT packet for a push button switch
 - LED light remains on while not pressed, turns off when pressed
 - Future versions of the firmware will allow the user to configure as a light to control when the LED is on or off
 - Remaining buttons: same functions
 - If the switch has an APIPA address due to not DHCP assigned, LED lights blink
 - If “reset” button is pressed and held for 10 secs, it resets to factory firmware defaults
 - LED lights blink rapidly for 5 seconds before the reset