HomeKit32

A modular smart-home automation framework for the Keyestudio Smart Home Kit (KS5009), powered by ESP32, BLE, MQTT and B4X.

Overview

HomeKit32 is a modular smart-home control system based on the Keyestudio Smart Home Kit (KS5009) and the Keyestudio ESP32 Plus microcontroller.
It provides real-time communication via BLE and MQTT, integrates 13 sensors and actuators, and exposes a clean, structured protocol for external applications.

The firmware is written in B4R, with performance-critical functionality implemented in wrapped C++ libraries.
Client applications currently exist for B4J, B4A and Python to complete the cross-platform ecosystem.
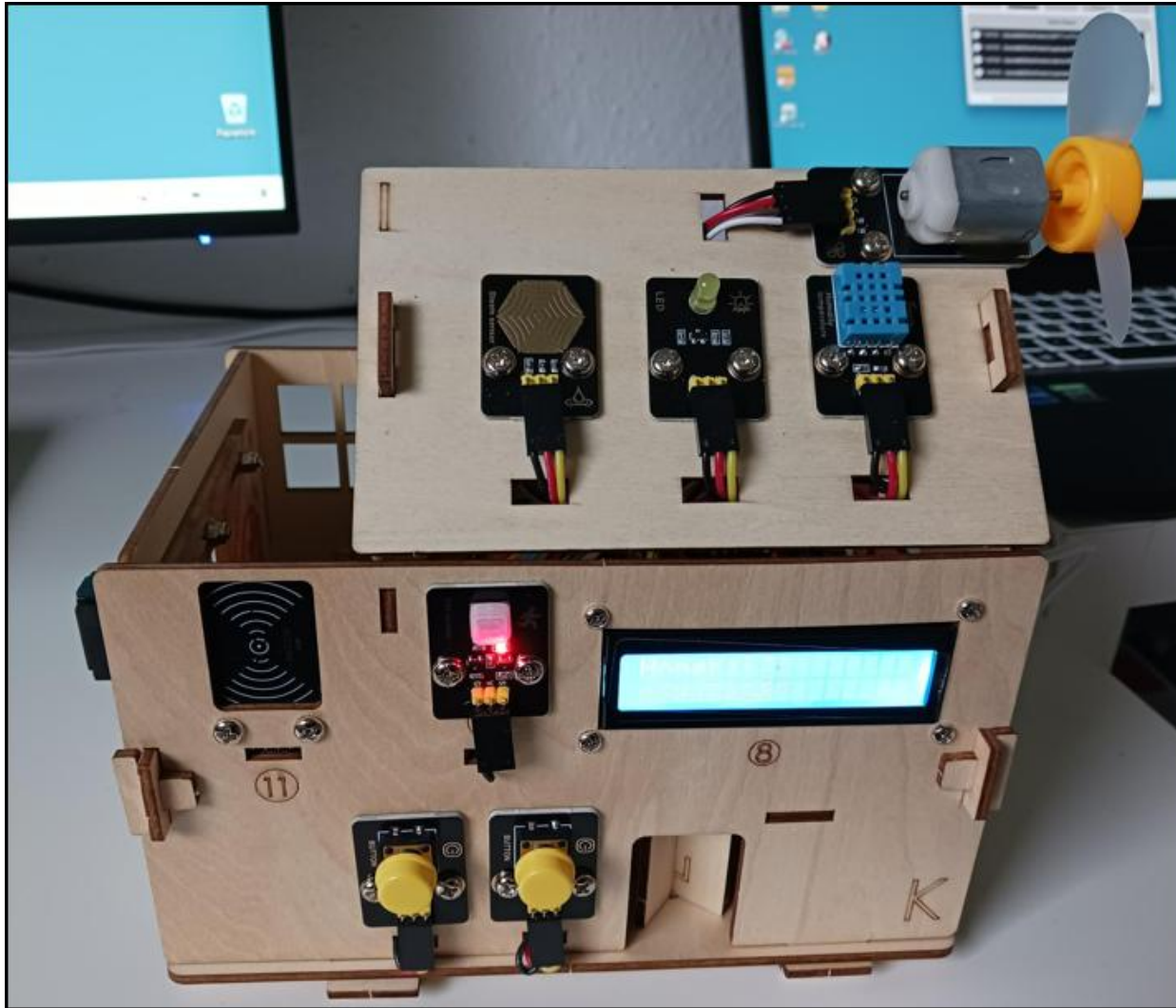
HomeKit32 is ideal for education, prototyping, IoT experiments, and as a reference architecture for a clean, extensible, multi-protocol smart-home system.

IMPORTANT

This example is for educational & personal use only.
It is NOT meant to be used for commercial purposes, nor to replace the original device.
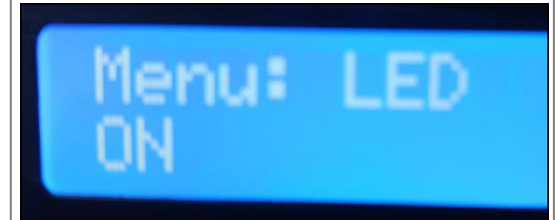
Kit assembled.

Menu
Button left select menu item displayed on the LCD1602 (top row).
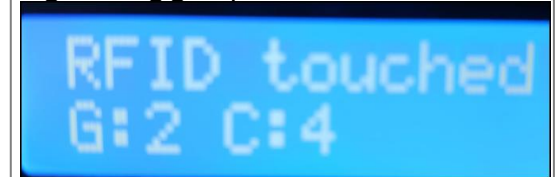Button right select menu item state (bottom row).
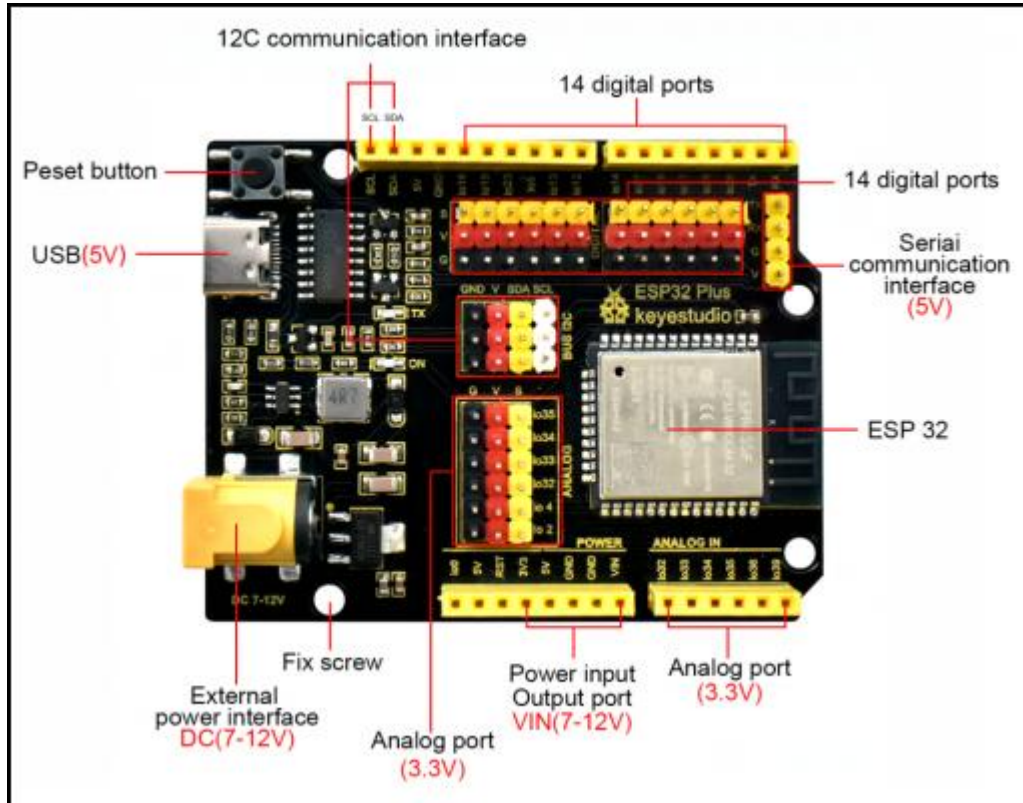Example:
Menu: LED, state ON or OFF

RFID
Open or closed door when touched with tag holding group 2 and command 4.

Keyestudio ESP32 Plus Pinout

Communication
WiFi, MQTT
BLE (UART)
Serial (Arduino, B4R upload)

Pin mapping
===== LEDs =====
Public ONBOARDLED_PIN As Byte = 2
Public YELLOW_LED_PIN As Int = 12
Public RGB_LED_PIN As Int = 26
===== Buttons =====
Public BTN_LEFT_PIN As Int = 16
Public BTN_RIGHT_PIN As Int = 27
===== PIR Sensor (Motion) =====
Public PIR_SENSOR_PIN As Int = 14
===== DHT11 Temp + Hum =====
Public DHT11_PIN As Int = 17
===== Moisture Sensor (Analog) =====
Public MOISTURE_SENSOR_PIN As Int = 34
===== Gas Sensor (Analog) =====
Public GAS_SENSOR_PIN As Int = 23
===== Audio =====
Public BUZZER_PIN As Int = 25
===== Fan =====
Public FAN_DIRECTION_PIN As Int = 19
Public FAN_SPEED_PIN As Int = 18
===== Servos =====
Public SERVO_WINDOW_PIN As Int = 5
Public SERVO_DOOR_PIN As Int = 13
===== I2C Devices =====
Public RFID_I2C_ADDRESS As Byte = 0x28   ' RFID Mifare
Public LCD_I2C_ADDRESS As Byte = 0x27   ' LCD1602

[Source Keyestudio](#)

HMI to control devices over BLE.

B4J Project
- B4X Pages Project
- B4J Layout Single Page
- HMI Tiles (Custom Views) (Human-Machine Interface) Default 120px x 120px
- Event log (CustomListView
- ISA-101 Guidelines aligned (Human-Machine Interface Design)

Communication Mode
- BLE
- BLE Frame: [DeviceID][Command][Payload...] Optional response (GET/request commands): [DeviceID][Command][Response...]
- Example Payload switch YellowLED ON: Byte Array with 3 bytes: 0x01 0x01 0x01 Device-ID Command-ID Payload
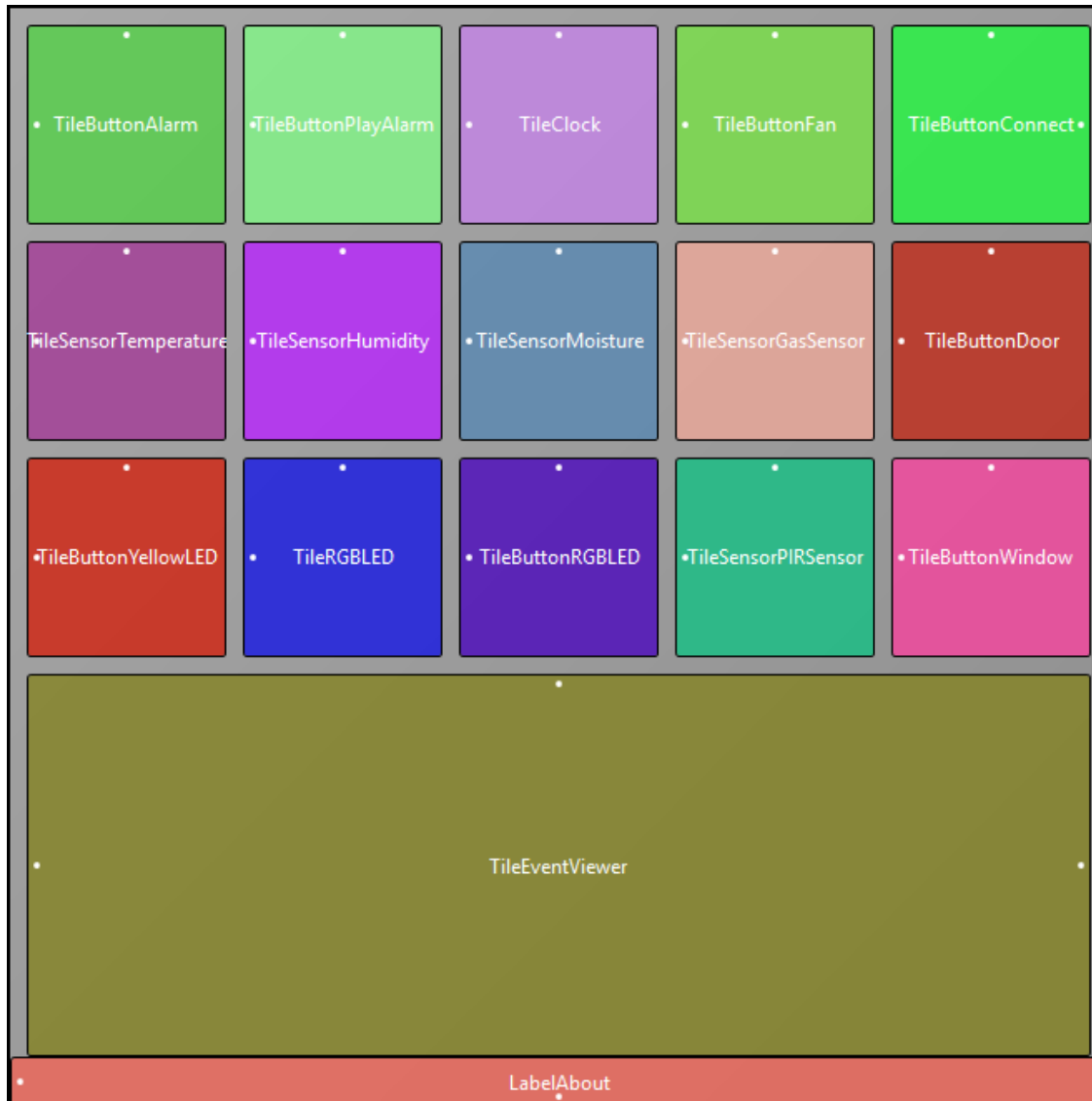
BLE - B4J Client HK32Commander

HomeKit32 Commander v20251207

Commands

- Turn RGB LED on (Neopixel)
- **Door Open**
  - Open Entrance Door (Servo)
- **Door Close**
  - Close Entrance Door (Servo)
- **Window Open**
  - Open Window (Servo)
- **Window Close**
  - Close Window (Servo)
- **Temperature**
  - Request Temperature (DHT11)
- **Humidity**
  - Request Humidity (DHT11)
- **Police Siren**
  - Police siren once (Buzzer)
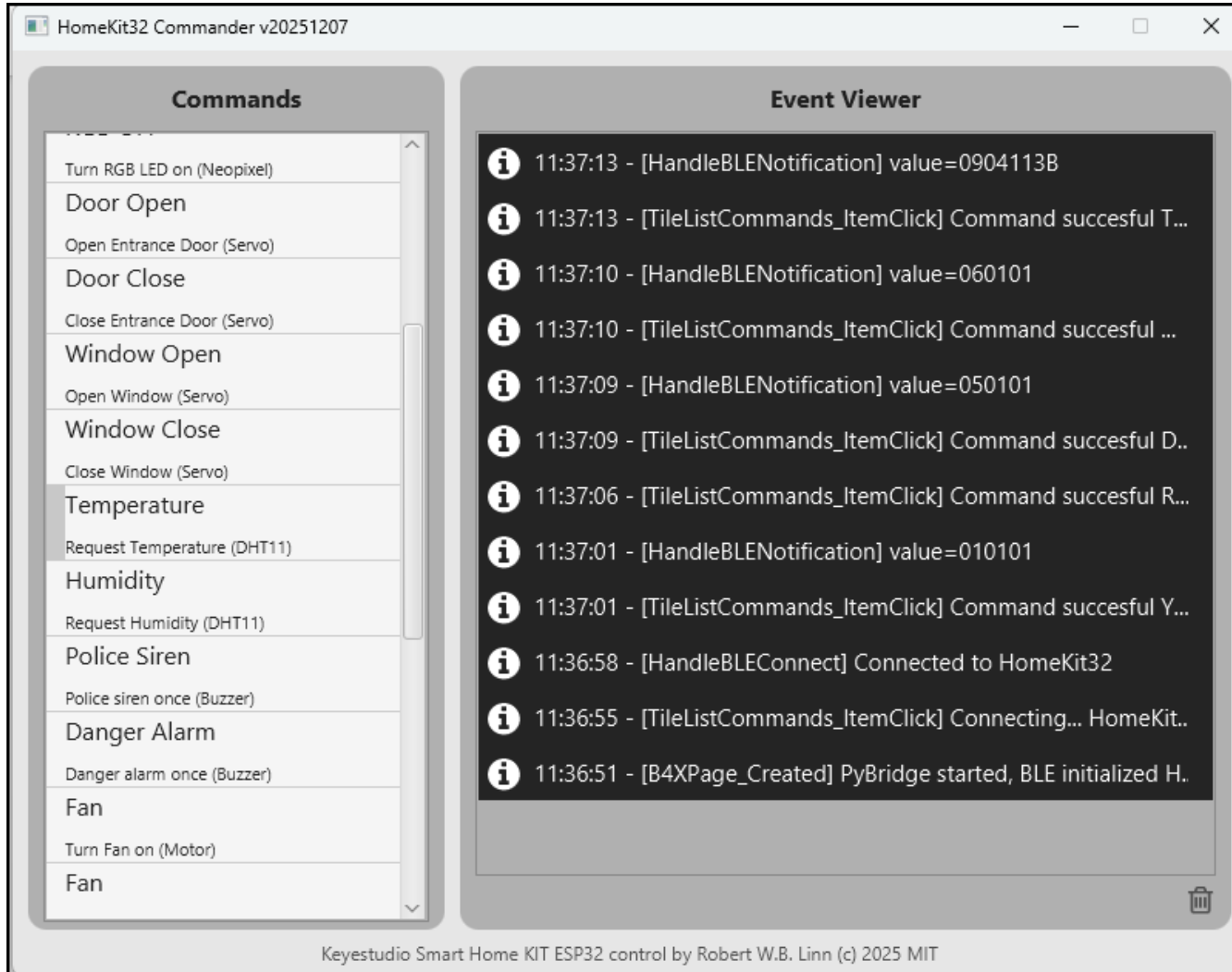- **Danger Alarm**
  - Danger alarm once (Buzzer)
- **Fan**
  - Turn Fan on (Motor)
- **Fan**

Event Viewer

- ℹ 11:37:13 - [HandleBLENotification] value=0904113B
- ℹ 11:37:13 - [TileListCommands_ItemClick] Command succesful T...
- ℹ 11:37:10 - [HandleBLENotification] value=060101
- ℹ 11:37:10 - [TileListCommands_ItemClick] Command succesful ...
- ℹ 11:37:09 - [HandleBLENotification] value=050101
- ℹ 11:37:09 - [TileListCommands_ItemClick] Command succesful D..
- ℹ 11:37:06 - [TileListCommands_ItemClick] Command succesful R...
- ℹ 11:37:01 - [HandleBLENotification] value=010101
- ℹ 11:37:01 - [TileListCommands_ItemClick] Command succesful Y...
- ℹ 11:36:58 - [HandleBLEConnect] Connected to HomeKit32
- ℹ 11:36:55 - [TileListCommands_ItemClick] Connecting... HomeKit..
- ℹ 11:36:51 - [B4XPage_Created] PyBridge started, BLE initialized H..

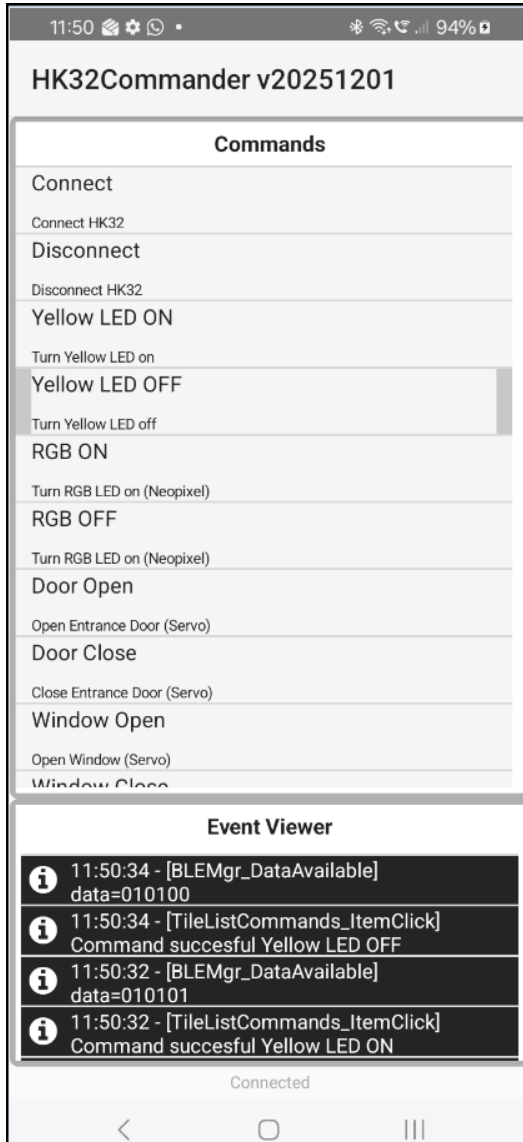Keyestudio Smart Home KIT ESP32 control by Robert W.B. Linn (c) 2025 MIT

Test Commands to control devices over BLE.

B4J Project
- B4X Pages Project
- B4J Layout Single Page
- Commands List (CustomListView)
- Event Viewer (CustomListView

Test Commands to control devices over BLE.

B4A Project
- B4X Pages Project
- B4A Layout Single Page
- Commands List
  (CustomListView)
- Event Viewer
  (CustomListView
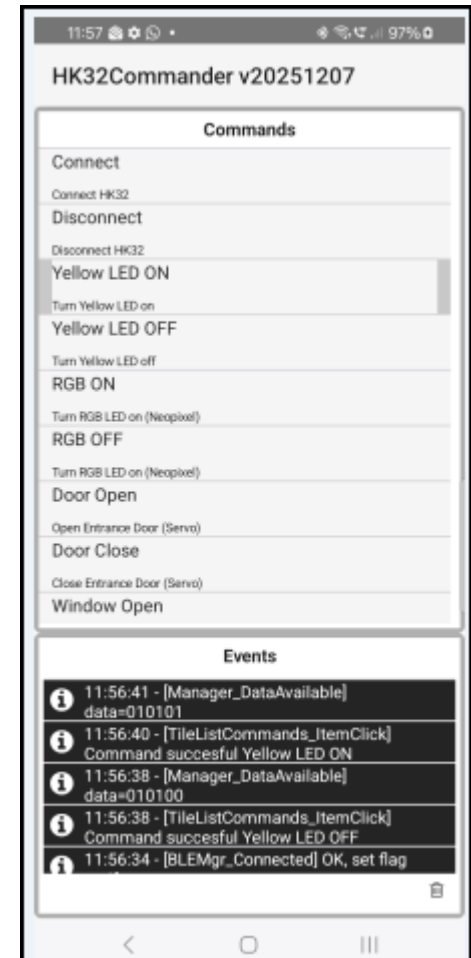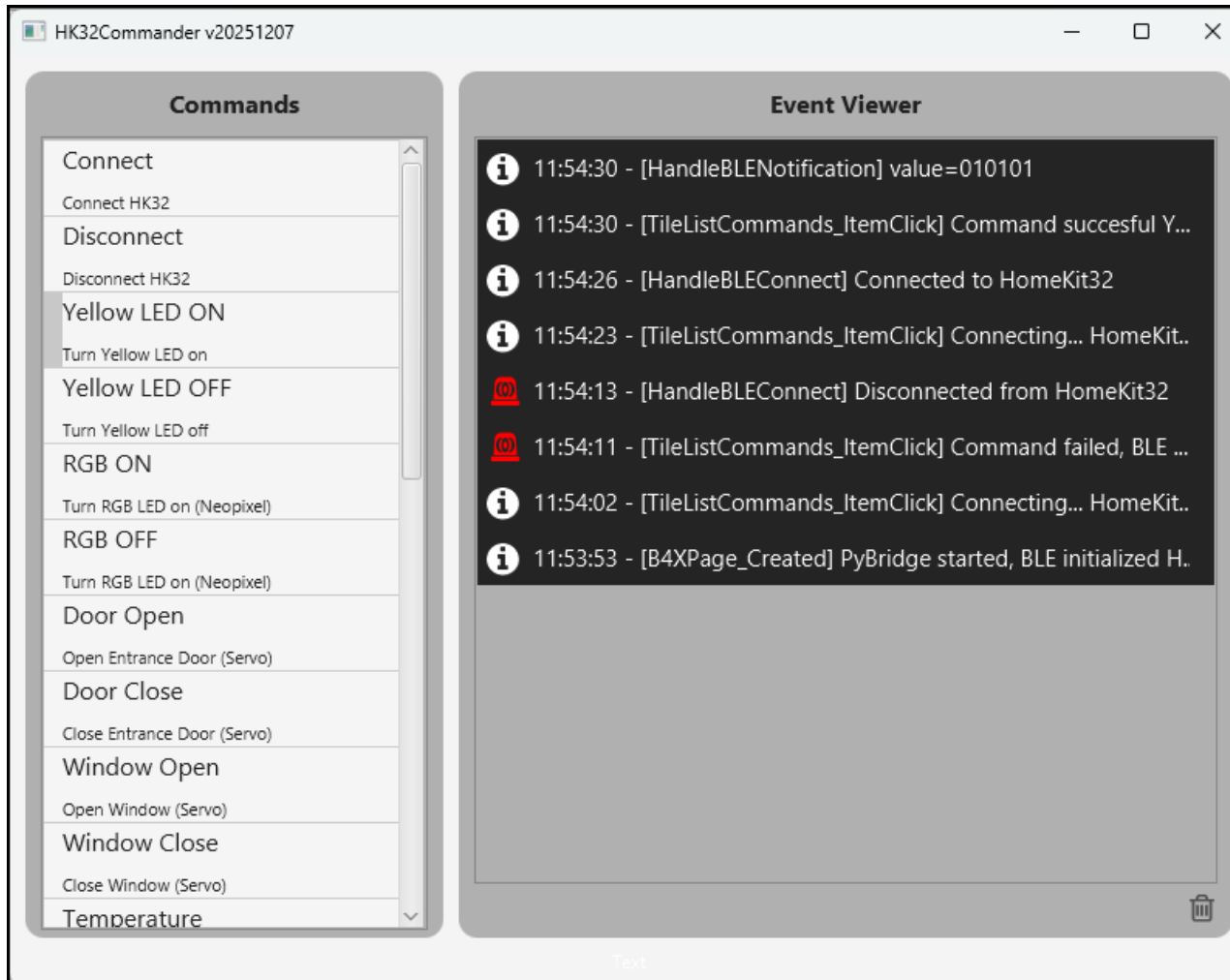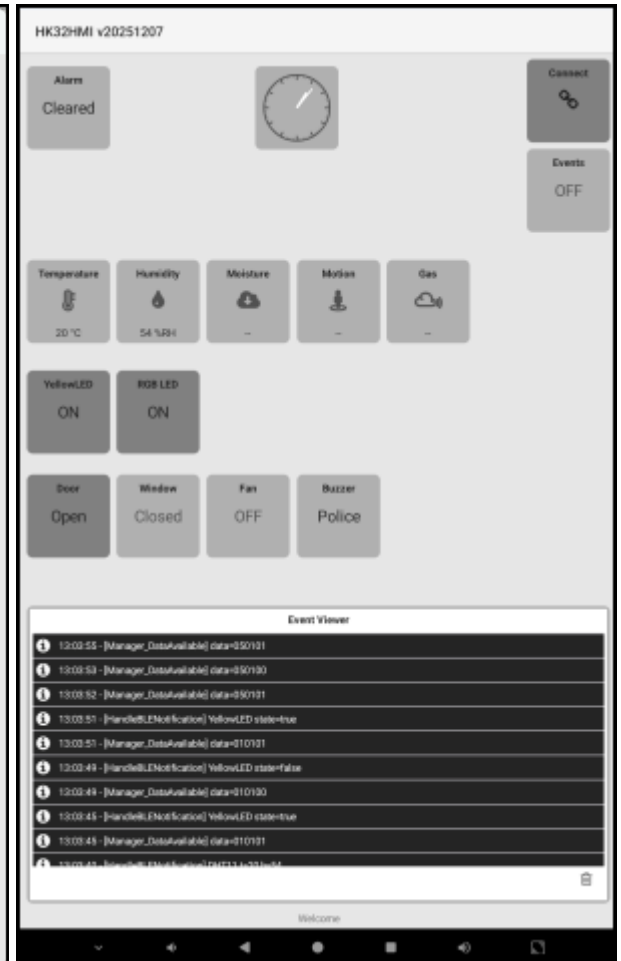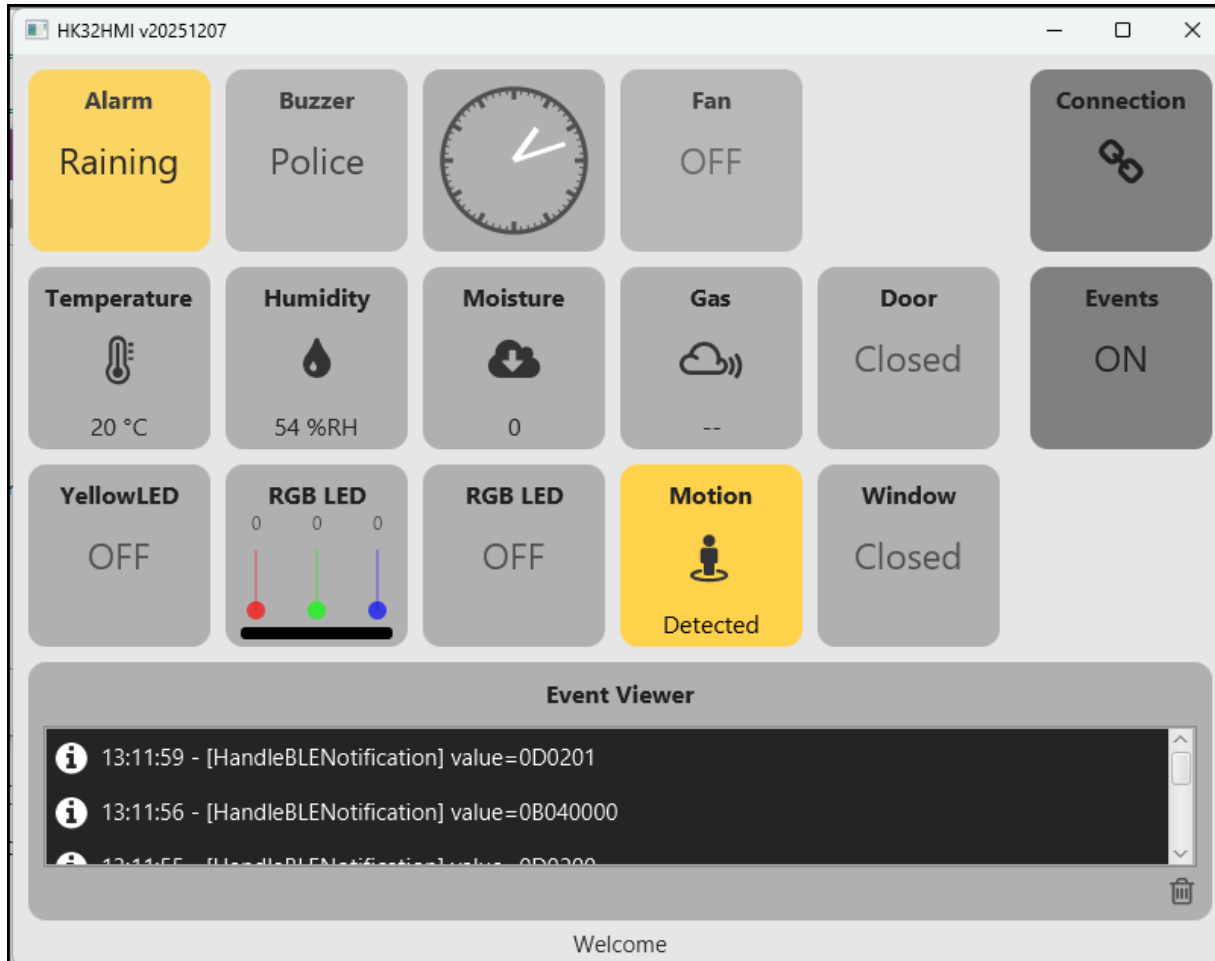
BLE - B4X Clients HK32Commander

B4A & B4J BLE clients (B4X project) to test direct commands to control devices.

BLE – B4J & B4A (B4X) Clients HK32HMI

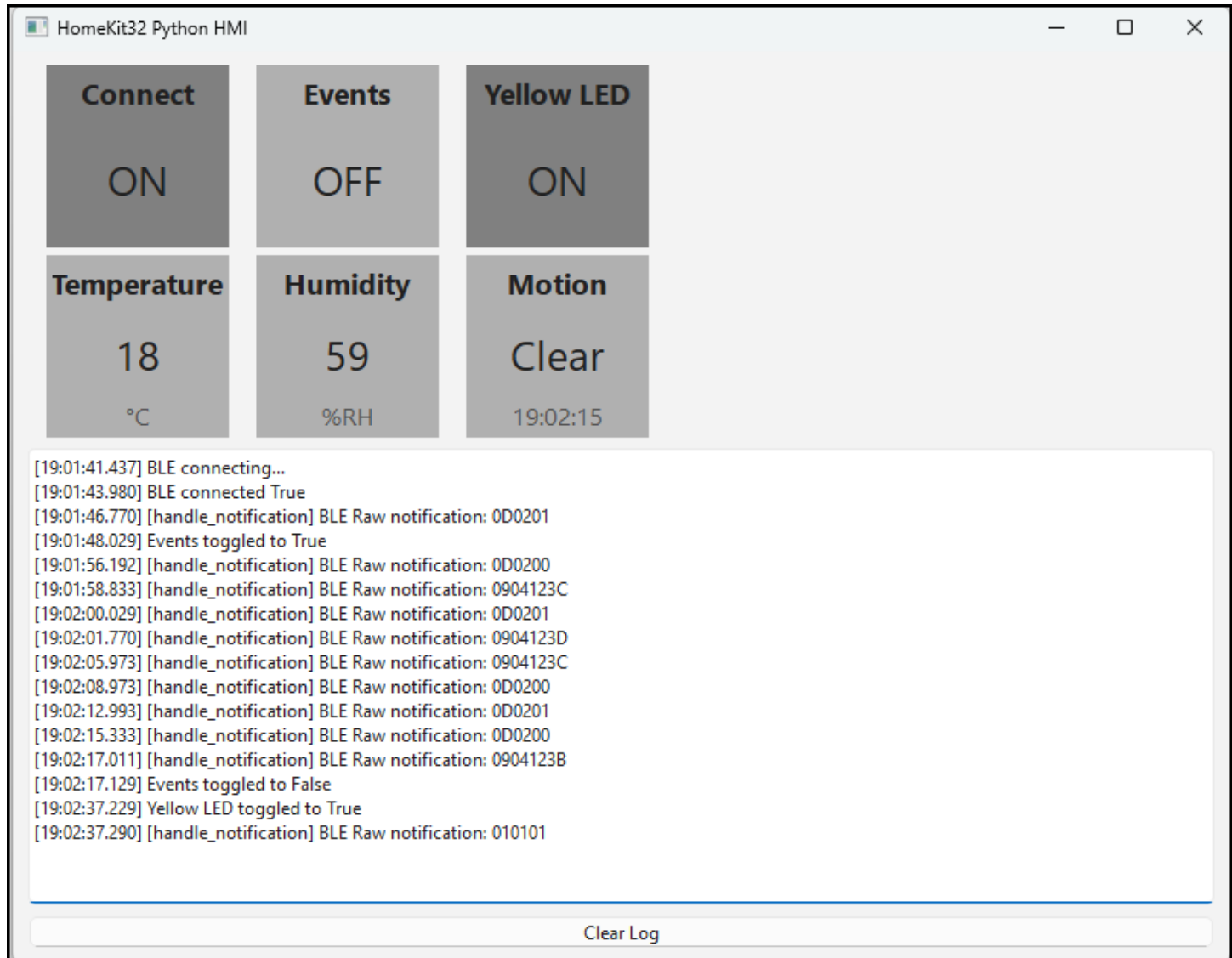B4A & B4J BLE clients (B4X project) HMI.

BLE - Python Client HK32HMI

Python with PySide6 framework example using same HMITile concept as B4X – selective TileButton & TileReadout.

TileButton

TileReadout

HomeKit32 Python HMI

Connect	Events	Yellow LED
ON	OFF	ON

Temperature	Humidity	Motion
18	59	Clear
°C	%RH	19:02:15

```
[19:01:41.437] BLE connecting...
[19:01:43.980] BLE connected True
[19:01:46.770] [handle_notification] BLE Raw notification: 0D0201
[19:01:48.029] Events toggled to True
[19:01:56.192] [handle_notification] BLE Raw notification: 0D0200
[19:01:58.833] [handle_notification] BLE Raw notification: 0904123C
[19:02:00.029] [handle_notification] BLE Raw notification: 0D0201
[19:02:01.770] [handle_notification] BLE Raw notification: 0904123D
[19:02:05.973] [handle_notification] BLE Raw notification: 0904123C
[19:02:08.973] [handle_notification] BLE Raw notification: 0D0200
[19:02:12.993] [handle_notification] BLE Raw notification: 0D0201
[19:02:15.333] [handle_notification] BLE Raw notification: 0D0200
[19:02:17.011] [handle_notification] BLE Raw notification: 0904123B
[19:02:17.129] Events toggled to False
[19:02:37.229] Yellow LED toggled to True
[19:02:37.290] [handle_notification] BLE Raw notification: 010101
```

Clear Log

MQTT - mosquitto

On Windows 11 device started the **mosquitto broker** and **subscribed** to topics **homekit32/home1/#**.
Submitted test commands using the mosquitto client **mosquitto_pub.** Example Yellow LED on:
mosquitto_pub.exe -t homekit32/home1/yellow_led/set -m {\"s\":\"on\"}

Mosquitto Broker

```
C:\WINDOWS\system32\cmd.  ×    +  ∨                               —    □    ×
1765183477: Received PUBLISH from auto-0B9C9BF3-AEE1-054C-52B0-701E2F9613B6 (d0, q0
, r0, m0, 'homekit32/home1/yellow_led/set', ... (10 bytes))
1765183477: Sending PUBLISH to homekit32 (d0, q0, r0, m0, 'homekit32/home1/yellow_l
ed/set', ... (10 bytes))
1765183477: Sending PUBLISH to auto-1116E697-CB28-CE36-3F15-41507BCAE531 (d0, q0, r
0, m0, 'homekit32/home1/yellow_led/set', ... (10 bytes))
1765183477: Received DISCONNECT from auto-0B9C9BF3-AEE1-054C-52B0-701E2F9613B6
1765183477: Client auto-0B9C9BF3-AEE1-054C-52B0-701E2F9613B6 disconnected.
1765183477: Received PUBLISH from homekit32 (d0, q0, r1, m0, 'homekit32/home1/yello
w_led/status', ... (10 bytes))
1765183477: Sending PUBLISH to auto-1116E697-CB28-CE36-3F15-41507BCAE531 (d0, q0, r
0, m0, 'homekit32/home1/yellow_led/status', ... (10 bytes))
1765183484: New connection from ::1:55980 on port 1883.
1765183484: New client connected from ::1:55980 as auto-CAA9919F-9091-CCED-C24B-FA3
FA1606BA1 (p2, c1, k60).
1765183484: No will message specified.
1765183484: Sending CONNACK to auto-CAA9919F-9091-CCED-C24B-FA3FA1606BA1 (0, 0)
1765183484: Received PUBLISH from auto-CAA9919F-9091-CCED-C24B-FA3FA1606BA1 (d0, q0
, r0, m0, 'homekit32/home1/yellow_led/set', ... (11 bytes))
1765183484: Sending PUBLISH to homekit32 (d0, q0, r0, m0, 'homekit32/home1/yellow_l
ed/set', ... (11 bytes))
1765183484: Sending PUBLISH to auto-1116E697-CB28-CE36-3F15-41507BCAE531 (d0, q0, r
0, m0, 'homekit32/home1/yellow_led/set', ... (11 bytes))
1765183484: Received DISCONNECT from auto-CAA9919F-9091-CCED-C24B-FA3FA1606BA1
1765183484: Client auto-CAA9919F-9091-CCED-C24B-FA3FA1606BA1 disconnected.
1765183484: Received PUBLISH from homekit32 (d0, q0, r1, m0, 'homekit32/home1/yello
w_led/status', ... (11 bytes))
1765183484: Sending PUBLISH to auto-1116E697-CB28-CE36-3F15-41507BCAE531 (d0, q0, r
0, m0, 'homekit32/home1/yellow_led/status', ... (11 bytes))
```

Subscribe Topics

```
C:\WINDOWS\system32\cmd.  ×    +  ∨                               —    □    ×
c:\Daten\projects\make\make-homekit32\servers\mosquitto>REM Subscribe to mosquitto payload homekit
32/home1/#

c:\Daten\projects\make\make-homekit32\servers\mosquitto>c:\Prog\mosquitto\mosquitto_sub.exe –v –t
homekit32/home1/#
homekit32/home1/yellow_led/set {"s":"on"}
homekit32/home1/yellow_led/status {"s":"on"}
homekit32/home1/yellow_led/set {"s":"off"}
homekit32/home1/yellow_led/status {"s":"off"}
```

Publish Topics

```
C:\WINDOWS\system32\cmd.  ×    +  ∨                                                                —    □    ×
Microsoft Windows [Version 10.0.26200.7309]
(c) Microsoft Corporation. Alle Rechte vorbehalten.

c:\Daten\projects\make\make-homekit32\servers\mosquitto>c:\Prog\mosquitto\mosquitto_pub.exe –t homekit32/home1/yellow_led/set –m {\"s\":\"on\"}

c:\Daten\projects\make\make-homekit32\servers\mosquitto>c:\Prog\mosquitto\mosquitto_pub.exe –t homekit32/home1/yellow_led/set –m {\"s\":\"off\"}

c:\Daten\projects\make\make-homekit32\serv
```

B4R IDE Log
GlobalStoreHandler.Put][I] slot=0, bufferlength=31, Max=200, data size=10, hex=7B2273223A226F6E227D
[CommMQTT.MQTT_MessageArrived][I] topic=homekit32/home1/yellow_led/set, index=1, payload={"s":"on"}, storeindex=0
[DevYellowLed.ProcessMQTT] storeindex=0, payload={"s":"on"}

MQTT – B4J Broker (console app)

B4J console application acting as an MQTT broker.
Running on Windows 11 the MQTT broker us started, the MQTT internal client is connected and **subscribed** to topics **homekit32/#**.
Submitted test commands using the mosquitto client **mosquitto_pub.**
Example Yellow LED on / off:
mosquitto_pub.exe -i hk32client -t homekit32/home1/yellow_led/set -m {\"s\":\"on\"}
mosquitto_pub.exe -i hk32client -t homekit32/home1/yellow_led/set -m {\"s\":\"off\"}

Notes
Mandatory to set the MQTT client ID, like hk32client (or any other name)
On Windows 11 the " characters must be escaped \"

MQTT Broker B4J IDE Log

```
[Main.AppStart][I] HomeKit32 Broker Starting
[Main.AppStart][I] Broker IP 192.168.1.94
[Main.AppStart][I] Broker initialize on port 1883
[Main.AppStart][I] Broker started
[Main.AppStart][I] MQTT internal client connected
[Main.MQTT_Connected][I] OK. Subscribed to homekit32/#
[MQTT_MessageArrived][I] Topic=homekit32/home1/yellow_led/set, Payload={"s":"off"}
[MQTT_MessageArrived][I] Topic=homekit32/home1/yellow_led/set, Payload={"s":"on"}
[MQTT_MessageArrived][I] Topic=homekit32/home1/yellow_led/set, Payload={"s":"on"}
[MQTT_MessageArrived][I] Topic=homekit32/home1/yellow_led/status, Payload={"s":"on"}
[MQTT_MessageArrived][I] Topic=homekit32/home1/yellow_led/set, Payload={"s":"off"}
[MQTT_MessageArrived][I] Topic=homekit32/home1/yellow_led/status, Payload={"s":"off"}
```