

# CLASSROOM MANAGER

Start Slide





Group 23

Praktikum

Sistem Waktu Nyata dan IOT

# GET TO KNOW US



**M Hilmi Al Muttaqi**  
230627082



**R Aisha Syauqi R**  
2306250554



**Wesley Frederick Oh**  
2306202763



**M Riyandri Satrio Wibowo**  
2306229323





# LATAR BELAKANG

## Masalah

**Manajemen kelas bergantung pada petugas (janitor) untuk buka-tutup pintu, sehingga rentan terlambat atau lupa dikunci (human error).**

**Kunci fisik mudah hilang, diduplikasi, atau tertukar, serta tidak memiliki riwayat pencatatan (no access logs) siapa yang masuk.**

**Pendingin ruangan (AC) dan lampu sering tertinggal menyala di ruang kelas yang sedang kosong/tidak digunakan.**

## Solusi

**Sistem kontrol pintu otomatis berbasis ESP32 dan FreeRTOS yang mengurangi ketergantungan pada tenaga manusia**

**Implementasi Challenge-Response via Bluetooth yang aman dari duplikasi kunci fisik maupun serangan digital (replay attack).**

**Integrasi sensor PIR untuk mendeteksi keberadaan orang dan mematikan perangkat listrik secara otomatis saat ruangan kosong.**



# TUJUAN PROYEK

- Peningkatan keamanan kelas dengan mencegah akses ilegal dan duplikasi kunci fisik dengan menerapkan sistem autentikasi digital terenkripsi (BLE).
- Efisiensi energi & biaya dengan mengurangi pemborosan listrik dengan mematikan perangkat elektronik (AC/Lampu) secara otomatis saat kelas kosong.
- Menggantikan sistem kunci manual yang merepotkan dengan manajemen akses berbasis Role (Admin/Dosen) yang terpusat dan terdata.

# FITUR UTAMA

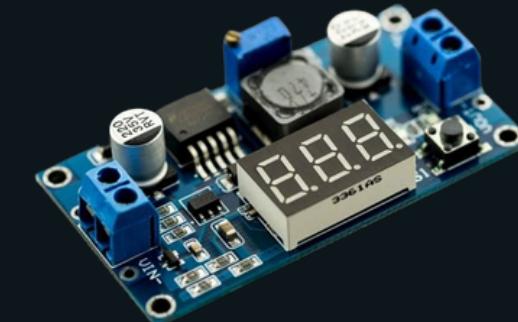
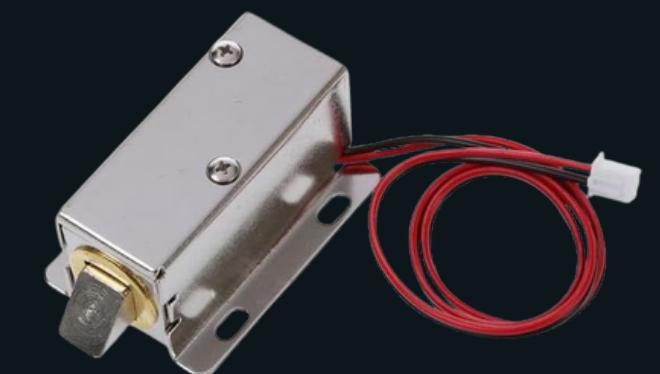
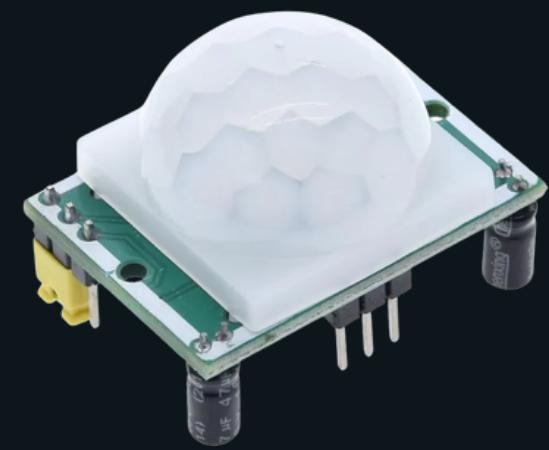
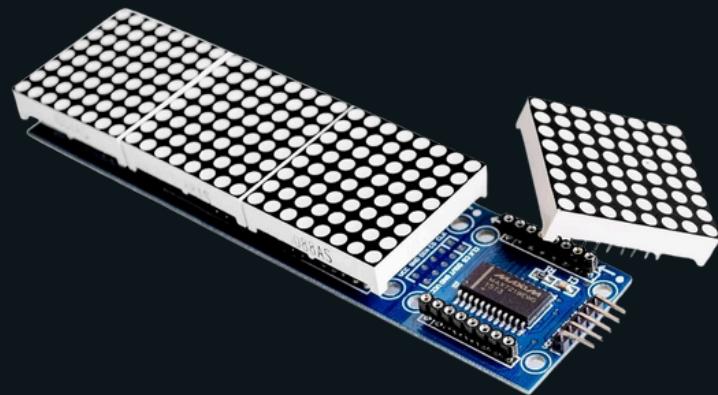
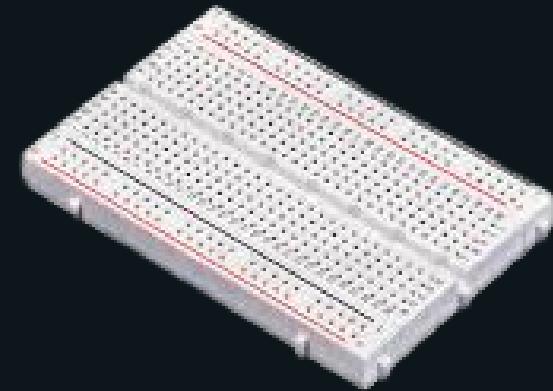
Autentikasi aman via BLE  
Challenge-Response yang anti-duplikasi.

Otomatisasi kunci pintu & hemat energi berbasis deteksi gerak (PIR).

Pemantauan status dan log akses secara real-time di Dashboard.



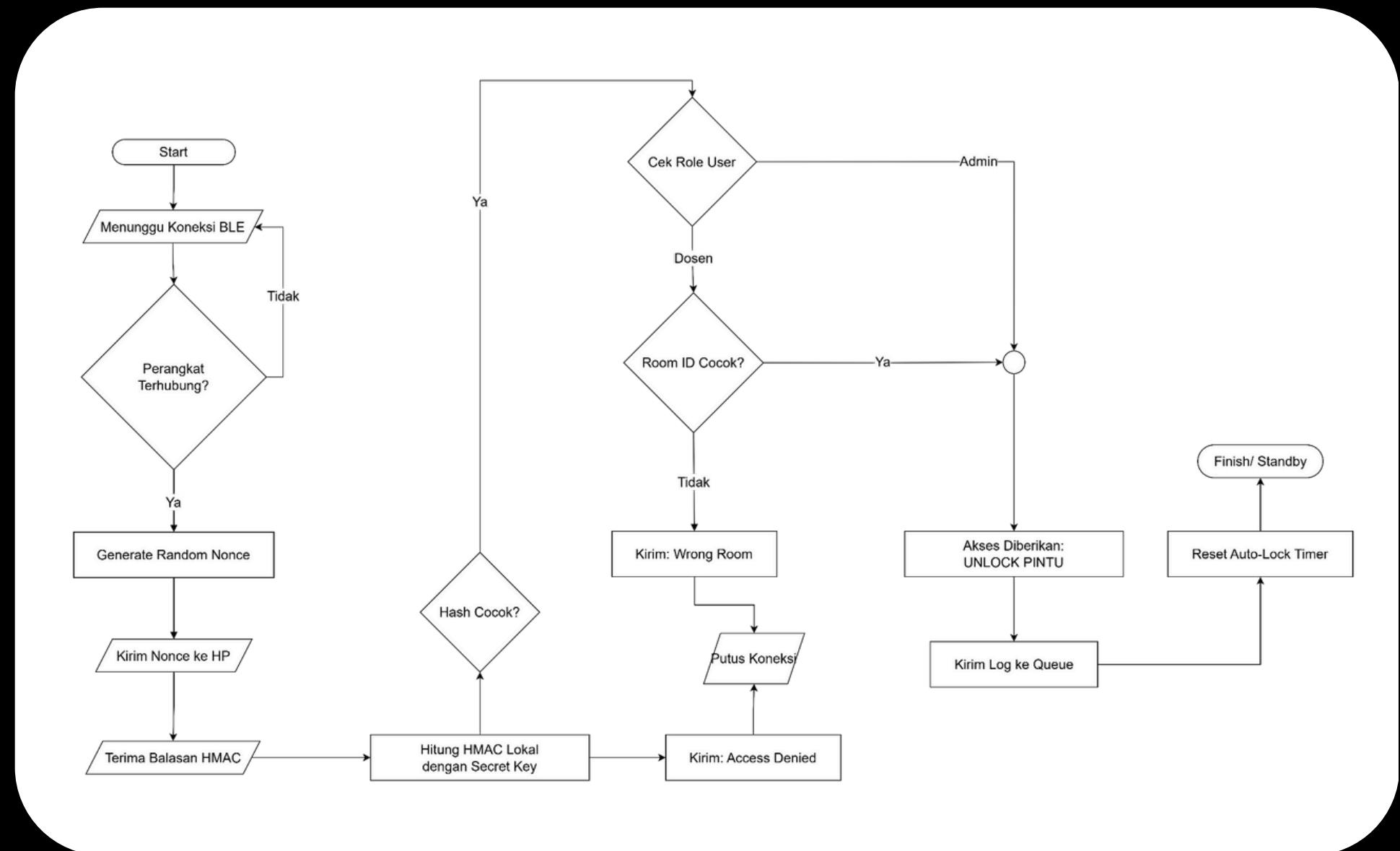
# COMPONENTS





# FLOWCHART

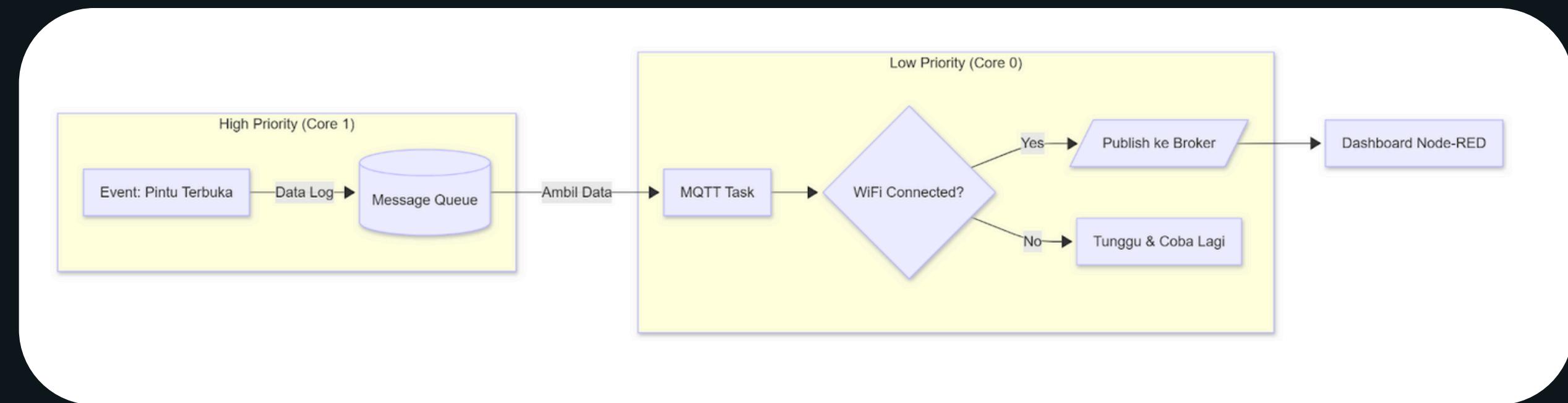
Proses Autentikasi BLE dan Kontrol Solenoid





# FLOWCHART

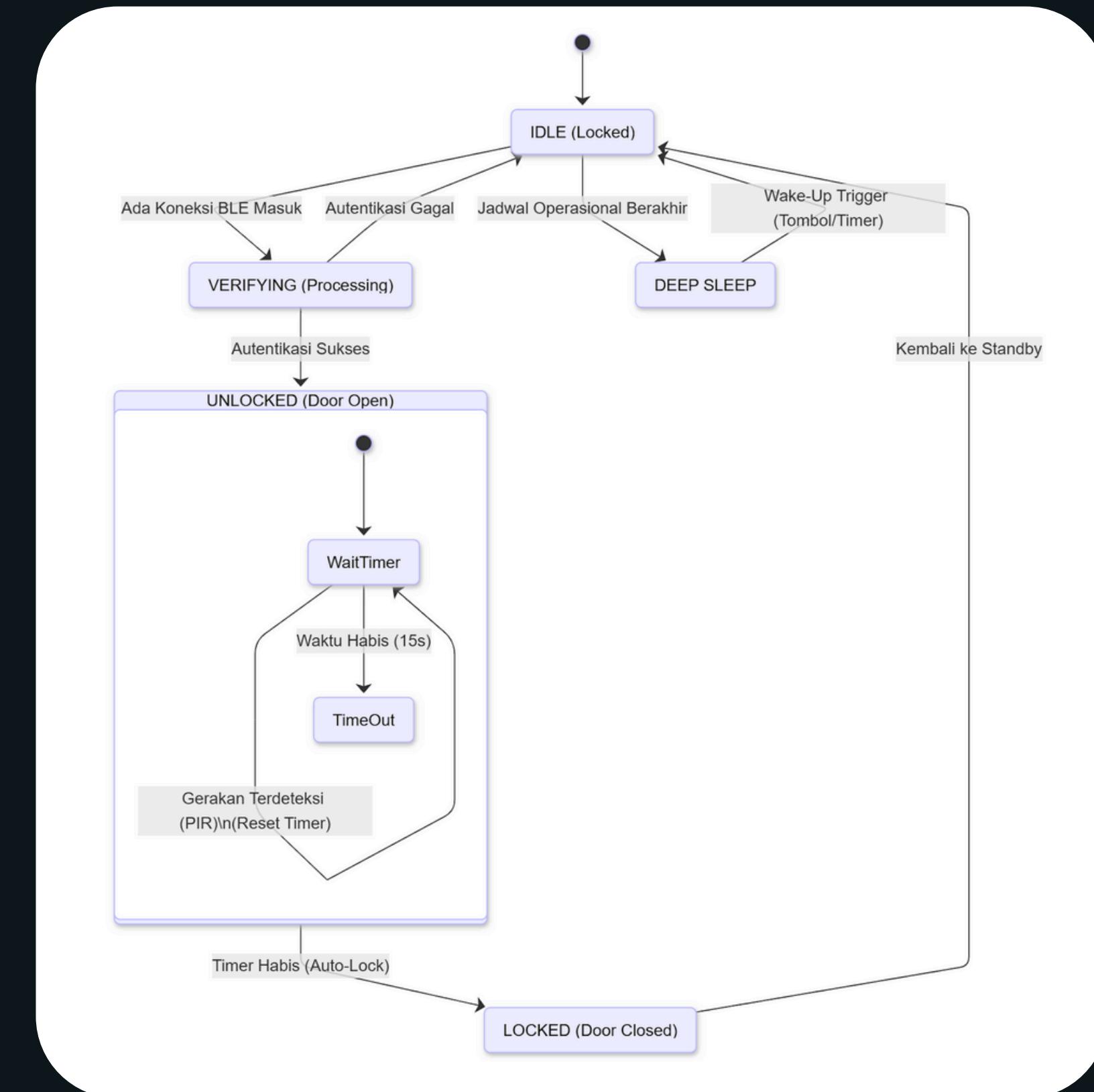
Pengiriman Data Melalui MQTT dan Queue Buffering





# FLOWCHART

State Machine Operasi Sistem Classroom Manager





# TESTING & RESULT

```
17:17:48.844 -> [BLE] Device Connected.  
17:17:51.771 -> [BLE] ID Rx: LEC_E  
17:17:51.771 -> [AUTH] User Found: LEC_E  
17:17:51.841 -> [BLE] Nonce Rx: 434497  
17:17:51.841 -> [BLE] Sent Hash: 2798289f036d38147b767bdc40e829f8ad1f111697e57eca7acf4f6ecf62e33d  
17:17:51.962 -> [BLE] ID Rx: OPEN  
17:17:51.962 -> [ACCESS] Granted (Lecturer)  
17:17:52.004 -> [DOOR] Unlocking...
```

Validasi Autentikasi Kriptografi





# TESTING & RESULT

```
[AUTH] User Found: LEC_E
[BLE] Nonce Rx: 434497
[BLE] Sent Hash: 2798289f036d38147b767bdc40e829f8ad1f111697e57eca7acf4f6ecf62e33d
[BLE] ID Rx: OPEN
[ACCESS] Granted (Lecturer)
[DOOR] Unlocking...
[PIR] Motion Detected - Timer Extended.
[BLE] OPEN command ignored (spam/cool-down protection)
```

Verifikasi Sinkronisasi Kredensial





# TESTING & RESULT

```
Connecting to WiFi.....  
WiFi Timeout. Switching to Offline Mode.  
Attempting to load offline Database...  
Offline Data Found.  
--- RAW PAYLOAD START ---  
{ "success":true,"message":"Found all users","data":[] }  
--- RAW PAYLOAD END ---
```

Uji Resiliensi dan Toleransi Kesalahan





# TESTING & RESULT

Live Status		Access Logs		
Door Status:	LOCKED	Time	User	Room
		07/12/2025, 17.17.52	LEC_E	ROOM_404
		06/12/2025, 18.09.01	LEC_C	ROOM_303
		06/12/2025, 18.39.08	LEC_B	ROOM_404

Integritas Telemetri Data dan Pemantauan Real-Time





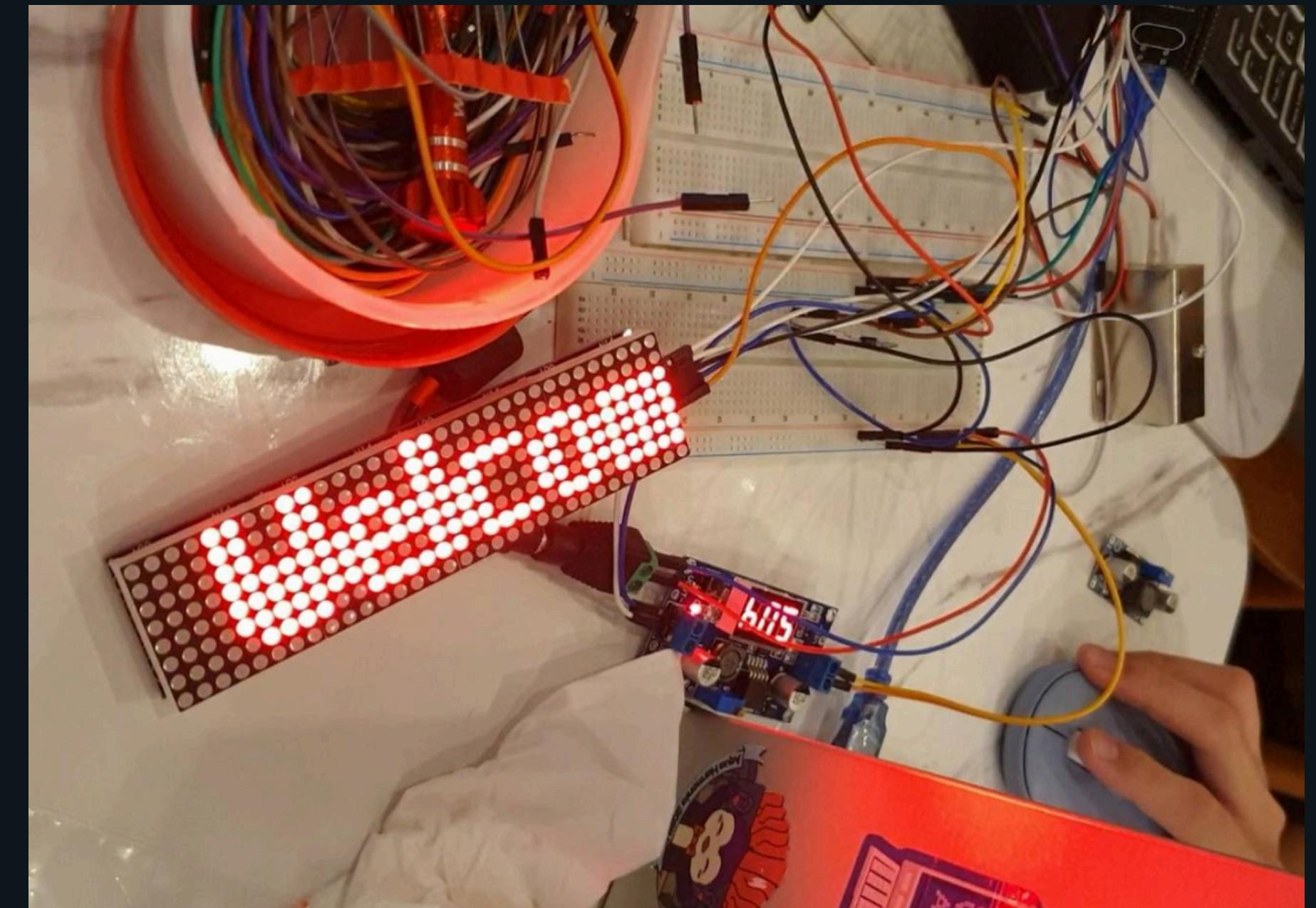
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# TESTING & RESULT

Verifikasi Sinkronisasi Umpan Balik Visual





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# THANK YOU

See you Next Time