

Electromagnetic Temporary Access Lock System (TAA-1) Full Whitepaper

Abstract:

This whitepaper defines a modular electromagnetic temporary access system designed for shared community appliances and resources.

The system enables time-based, condition-based, and permission-based access without reliance on invasive identity tracking.

Core Concept:

Temporary access replaces ownership enforcement. The system grants controlled access windows to shared infrastructure such as

laundry machines, refrigerators, tool storage, and charging stations.

System Architecture:

Layer A – Physical: Electromagnetic lock, solenoid, enclosure, manual override

Layer B – Control: Microcontroller (ESP32), timer logic, relay switching

Layer C – Credential: Keypad, RFID, rotating access tokens

Layer D – Policy: Time windows, duration limits, grace periods

Layer E – Audit: Minimal event logging (non-identifying)

Hardware Components:

- 12V DC power supply
- Solenoid or electromagnetic lock
- ESP32 microcontroller
- Relay module
- Door/contact sensor
- Keypad or RFID reader
- Backup battery (optional)

Operational Flow:

1. User receives temporary access credential
2. System validates credential
3. Lock disengages for entry
4. Session timer begins
5. Optional: appliance power enabled
6. Session expires
7. Lock re-engages and power is cut

Safety Requirements:

- Fail-safe or fail-secure configuration must be defined
- Manual override required
- Fire/emergency conditions must release locks where applicable

Use Cases:

- Laundry room scheduling
- Shared refrigerator compartments
- Tool libraries and maker spaces
- EV and battery charging stations

Ethical Design Standard (TAA-1):

- No biometric dependency
- No unnecessary identity storage
- Local-first functionality
- Transparent access logic
- Minimal logging

Threat Model:

- Code sharing → mitigated by rotating tokens
- Physical tampering → reinforced enclosure
- Power loss → battery backup or safe mode
- Misuse → session-based enforcement

Scalability:

The system can scale from single-device deployments to full-building community infrastructure nodes.

Conclusion:

The TAA-1 system establishes a fair-access infrastructure layer, reducing conflict and enabling efficient shared resource usage

without centralized enforcement or surveillance.