

# RFID Access Management System: TagPass Project

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## Abstract

The TagPass project implements an integrated access control solution based on RFID technology, connected to cloud services through Supabase and managed from a web interface developed with Flask. The system allows event logging, user management, and real-time card blocking, while ensuring data integrity through local synchronization on the Raspberry Pi.

**Keywords:** RFID, Access Control, Supabase, Flask, IoT

## 1. Introduction

The TagPass system emerges as a solution designed for secure access control using RFID cards. The project integrates a reader module based on the Raspberry Pi, a backend in Supabase, and a web interface developed with Flask. The architecture enables card management, access monitoring, and blocking control from a centralized platform accessible through a web browser.

## 2. System Architecture

The operational flow begins when the Raspberry Pi reads the UID using the MFRC522 RFID module through the SPI protocol. A Python service runs a continuous loop that validates the read UID by querying a local SQLite database. The Raspberry maintains a copy of permissions and logs to operate offline.

When connectivity is available, the Raspberry Pi synchronizes access logs with Supabase and updates local states. The system uses *Supabase Realtime* to receive changes in blocked or enabled cards, ensuring immediate response without manual data refresh.

## 3. Web Interface with Flask

The administrative panel was developed in Flask 3 using the official `supabase-py` SDK. Access credentials for the project are stored in a `.env` file, following security best practices.

The panel includes authentication via *email and password* using Supabase Auth. Once authenticated, the user can access modules to manage users, cards, buildings, rooms, and historical logs.

The main view allows filtering access logs by UID, owner name, institutional ID, building, room, and date-time ranges.

## 4. Log and Blocking Management

The interface allows blocking or unblocking cards, recording reasons and dates, and managing assignments. These changes are instantly reflected in Supabase and received by the Raspberry Pi through real-time events.

When the Raspberry Pi is offline, it continues operating autonomously by validating against its local database. Once the connection is restored, it synchronizes pending records and updates the permissions table according to the current state in Supabase.

## 5. Project Structure

The system repository includes:

- Web templates: `layout.html`, `login.html`, `dashboard.html`.
- Static files in `static/`, including CSS and scripts.
- Python service for the Raspberry Pi responsible for reading, validation, and synchronization.
- `.gitignore` file to avoid exposing secrets or virtual environments.

## 6. RFID Module Design

The MFRC522 RFID module connects to the Raspberry Pi via SPI. Figure 1 shows the physical assembly used in the prototype, including the Raspberry Pi, protoboard, and corresponding wiring.

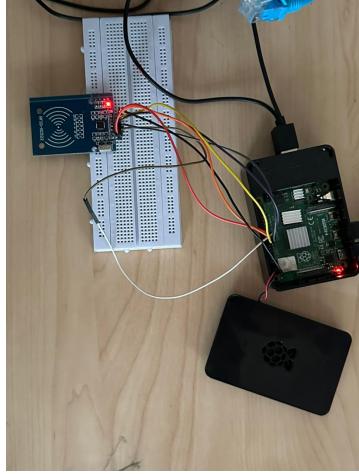


Figure 1: Physical assembly of the system: Raspberry Pi, MFRC522 module, and protoboard with wiring.



Figure 2: RFID identifiers used in the system: access card and keyfob.

### 6.1. RFID Identifiers Used

MIFARE Classic RFID cards were used in *card* and *keyfob* formats. Each identifier contains a unique UID used for authentication. Figure 2 shows the elements used in the tests.

## 7. Conclusions

TagPass presents a robust architecture based on hybrid synchronization (*online-offline*) using Supabase and Raspberry Pi. The integration between RFID hardware, local persistence, real-time events, and an administrative web interface enables efficient, scalable, and adaptable control for institutional environments.

## Project Repository

The source code of the TagPass system, including the synchronization logic, the service running on the Raspberry Pi, and the web interface developed in Flask, is available in the following public GitHub repository:

<https://github.com/Xan007/TagPass-RFID-Access-Management>

## Appendix: System Interface Screenshots

Below are real screenshots of the TagPass administrative dashboard, showing user management, space management, card management, access logs, and blocking operations.

The screenshot displays the TagPass administrative dashboard. At the top, there's a header with the TagPass logo, navigation links for Dashboard, Bloqueos, Espacios, Tarjetas, and user information (admin@admin.com, Mi Perfil, Cerrar sesión). Below the header is the 'Panel de Control' section, which monitors RFID access events. It shows three summary boxes: 'TOTAL DE EVENTOS' (7), 'ACCESO AUTORIZADO' (5), and 'ACCESO DENEGADO' (2). Below this is the 'Filtrar Accesos' (Filter Accesses) section with dropdowns for search type ('Todos'), search term ('Escribe para buscar...'), building ('Edificio'), room ('Salón'), and date range ('Desde (Fecha y Hora)'). Buttons for 'Aplicar Filtros' (Apply Filters) and 'Limpiar' (Clear) are present. The main content area is titled 'Últimos Accesos' (Last Accesses) and lists recent access logs. The table has columns: ESTUDIANTE, SALÓN, ESTADO, HORA, and ACCIONES. Each row shows an access record with student ID, room name, access status (AUTORIZADO or DENEGADO), timestamp, and a more button for actions. The first few rows show successful access (AUTORIZADO) and one denied access (DENEGADO).

ESTUDIANTE	SALÓN	ESTADO	HORA	ACCIONES
Uno 1111111	Laboratorio 1 Davinci	AUTORIZADO	2025-11-19 20:50	⋮
Cuatro 4444444444	Laboratorio 1 Davinci	AUTORIZADO	2025-11-19 20:49	⋮
Dos 2222222	Laboratorio 1 Davinci	DENEGADO	2025-11-19 20:49	⋮
Tres 3333333	Laboratorio 1 Davinci	AUTORIZADO	2025-11-19 20:49	⋮
Uno 1111111	Laboratorio 1 Davinci	AUTORIZADO	2025-11-19 20:48	⋮
Uno 1111111	Laboratorio 1 Davinci	DENEGADO	2025-11-19 20:48	⋮
Dos 2222222	Laboratorio 1 Davinci	AUTORIZADO	2025-11-19 20:47	⋮

**TagPass**  
Control inteligente de accesos RFID

Dashboard Bloqueos Espacios Tarjetas admin@admin.com Mi Perfil Cerrar sesión

## Tarjetas Bloqueadas

Gestiona las tarjetas RFID bloqueadas en el sistema.

**TOTAL BLOQUEADAS**

**1**

**Listado de Bloqueos**

TARJETA UID	ESTUDIANTE	SALÓN	EDIFICIO	RAZÓN	FECHA DE BLOQUEO	ACCIONES
193-131-82-211-195	Dos	Laboratorio 1	Davinci	—	2025-11-19	<button>Desbloquear</button>

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## Gestión de Espacios

Administra edificios y salones del campus.

**Edificios**

Davinci	<button>Editar</button>	<button>Eliminar</button>
Einstein	<button>Editar</button>	<button>Eliminar</button>

**+ Nuevo Edificio**

**Salones**

Davinci

Laboratorio 1	<button>Editar</button>	<button>Eliminar</button>
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**+ Nuevo Salón**

The screenshot shows the TagPass RFID Management System interface. At the top, there's a header bar with the TagPass logo, navigation links for Dashboard, Bloqueos, Espacios, Tarjetas, and user information (admin@admin.com, Mi Perfil, Cerrar sesión). Below the header, the main title is "Gestión de Tarjetas RFID" with the subtitle "Crea, edita y asigna tarjetas a usuarios." A blue button "+ Nueva Tarjeta" is visible. The main content area is titled "Tarjetas Disponibles" and contains a table with the following data:

UID	NOMBRE	CÓDIGO	USUARIO ASIGNADO	FECHA CREACIÓN	ACCIONES
23-73-170-89...	Cuatro	4444444444	Sin asignar	2025-11-19	⋮
237-207-132...	Tres	3333333	Sin asignar	2025-11-19	⋮
193-131-82-2...	Dos	2222222	Sin asignar	2025-11-19	⋮
25-121-155-1...	Uno	1111111	<b>SANDER SIERRA</b>	2025-11-19	⋮
carlos-tarje...	Carlos	160005003	Sin asignar	2025-11-18	⋮
sander-tarje...	Sander	160005033	<b>CARLOSBARRERA2528@GMAIL.COM</b>	2025-11-11	⋮