

IoT based Biometric Attendance System

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1. Purpose & requirements

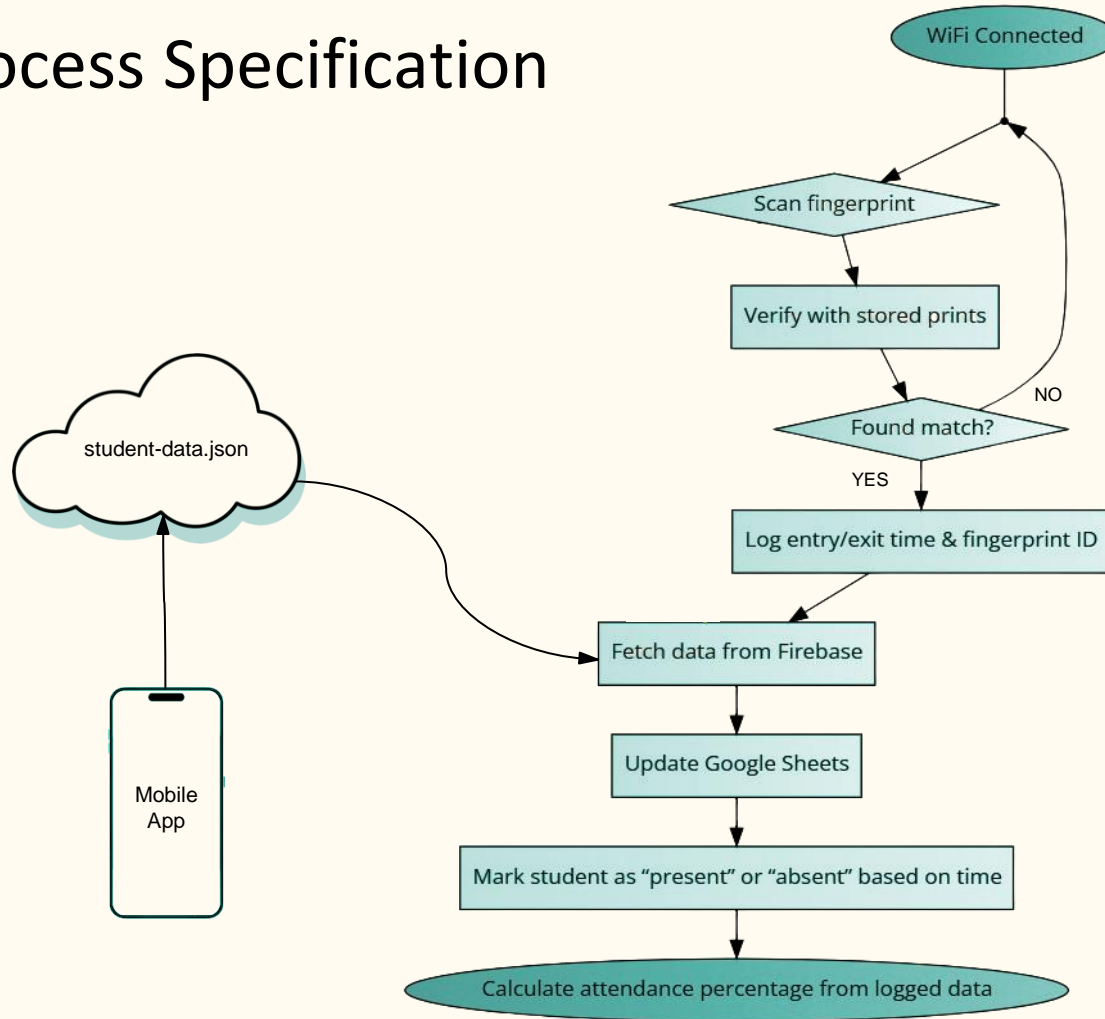
Purpose:

- An IoT-based attendance system using fingerprint authentication to log student entry and exit times, stored in Google Sheets and Firebase.
- Records entry/exit times for each fingerprint scan. Calculates presence/absence and attendance percentage over time.

Requirements:

- Manages student data (name, ID, email) in Firebase for secure access and retrieval.
- Calculates each student's attendance percentage based on recorded entries.
- Cloud-based deployment on Firebase, with future integration for mobile data entry.
- Uses secure data transfer between ESP32, Firebase, and Google Sheets.

2. Process Specification



3. Domain Model Specification

Physical Entity	<ul style="list-style-type: none">● Student: Attributes include name, registration ID, and fingerprint ID.● Fingerprint Sensor: Captures biometric data for identification.
Virtual Entity	<ul style="list-style-type: none">● Firebase: Stores student details.● Google Sheets: Logs attendance timestamps and updates details.
Device	<ul style="list-style-type: none">● ESP32: Communicates fingerprints and timestamps to Google Sheets.
Resource	<ul style="list-style-type: none">● On-device Resources: Fingerprint sensor and processing on ESP32.● Network Resources: Firebase (stores student data: name, email, ID, fingerprint ID) and Google Sheets (logs attendance timestamps and fetches student details from Firebase).
Service	<ul style="list-style-type: none">● Fingerprint Authentication Service: Verifies fingerprints and sends data to Google Sheets.● Attendance Logging Service: Records timestamps in Google Sheets.● Cloud Sync Service: Syncs data between Google Sheets and Firebase for detail updates.

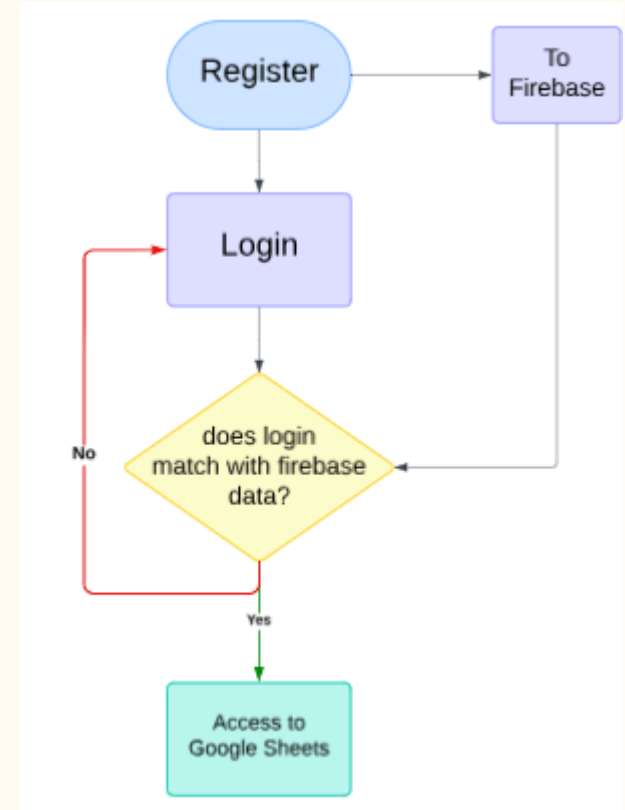
4. Information Model Specification

Data Structure:

- Student Data: Stored in Firebase with name, email, registration ID, and fingerprint ID.
- Attendance Log: Each entry in Google Sheets includes timestamp, fingerprint ID, and attendance status.

Data Flow:

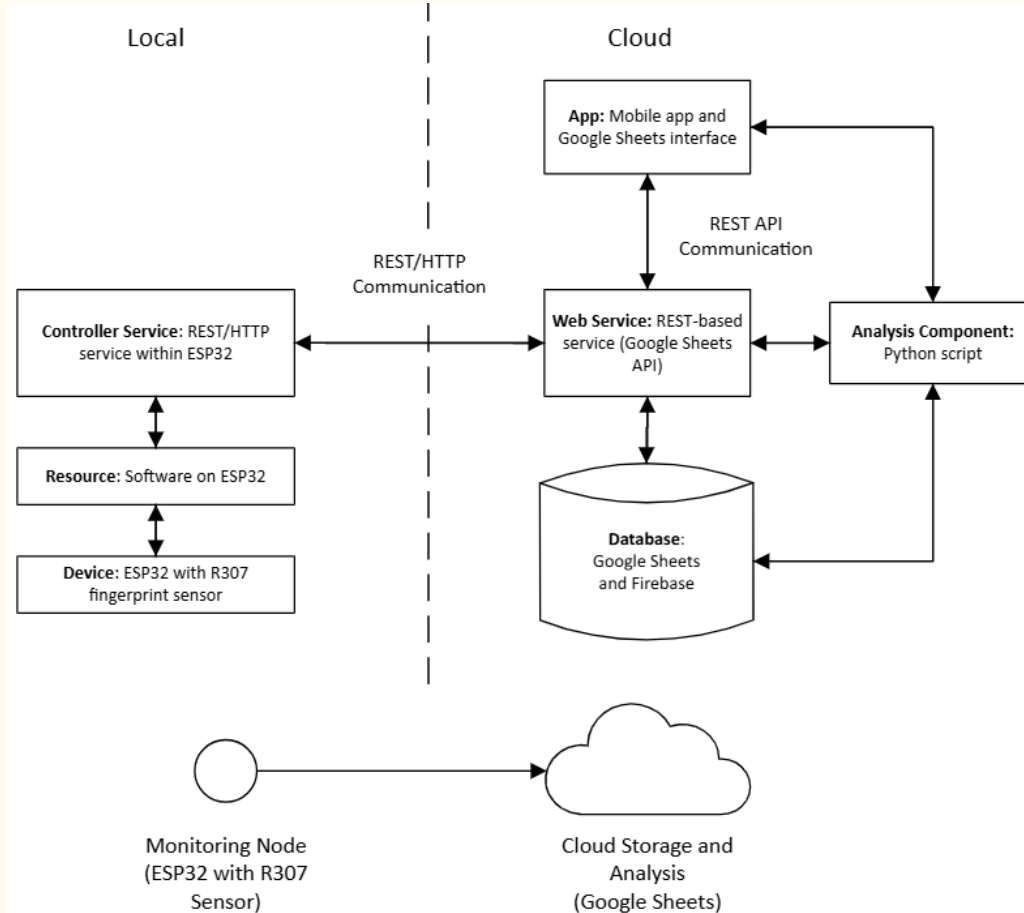
The fingerprint ID from Google Sheets is cross-referenced with the Firebase database to populate student details.



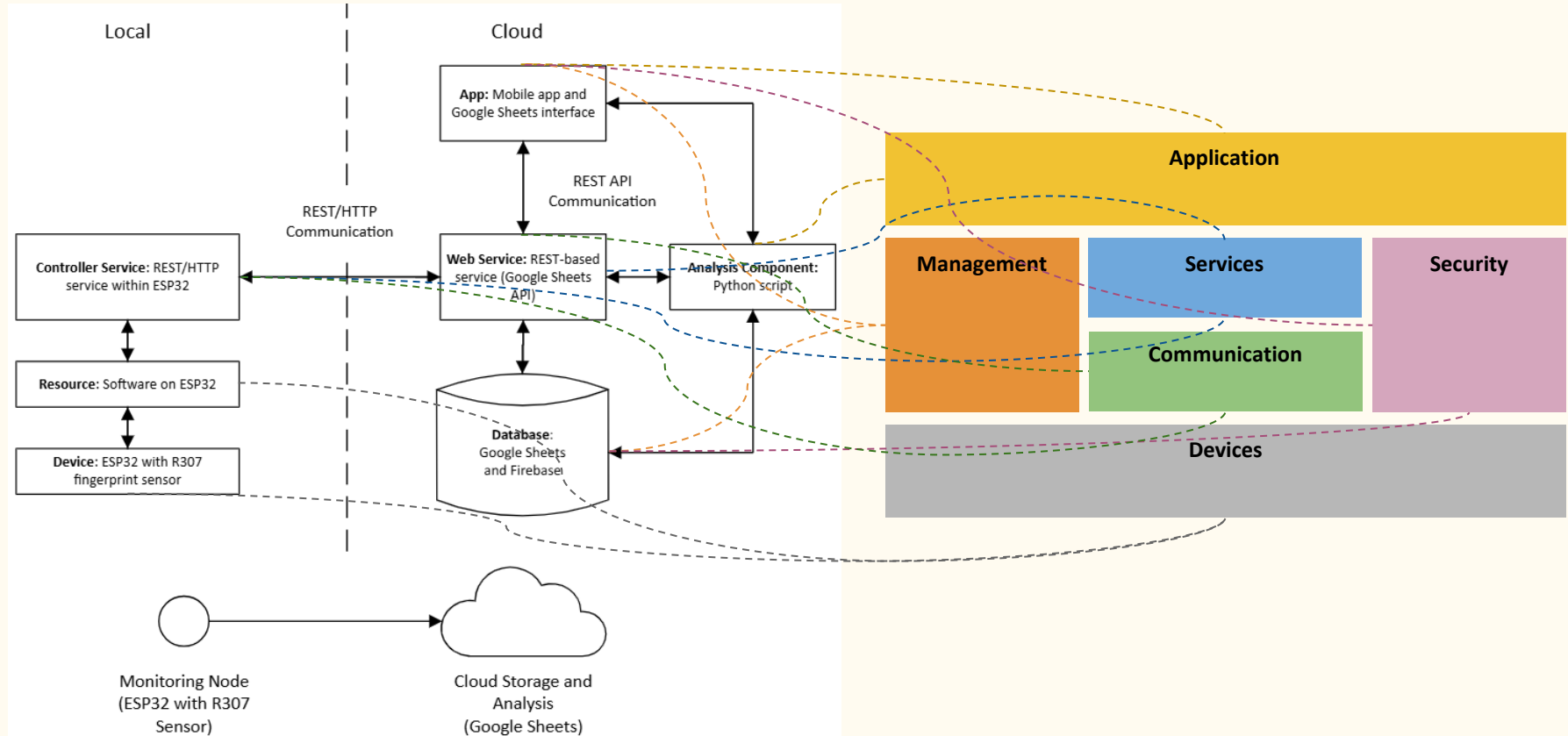
5. Service Specifications

- **Fingerprint Authentication Service:** Captures and verifies fingerprints via the ESP32 sensor.
- **Attendance Logging Service:** Logs the entry/exit timestamps in Google Sheets.
- **Cloud Sync Service:** Matches fingerprint ID in Google Sheets with student data from Firebase to retrieve and update student details.
- **Python Calculation Service:** Calculates attendance percentage and updates status in Google Sheets.

6. IoT Level Specification - IoT Level 3

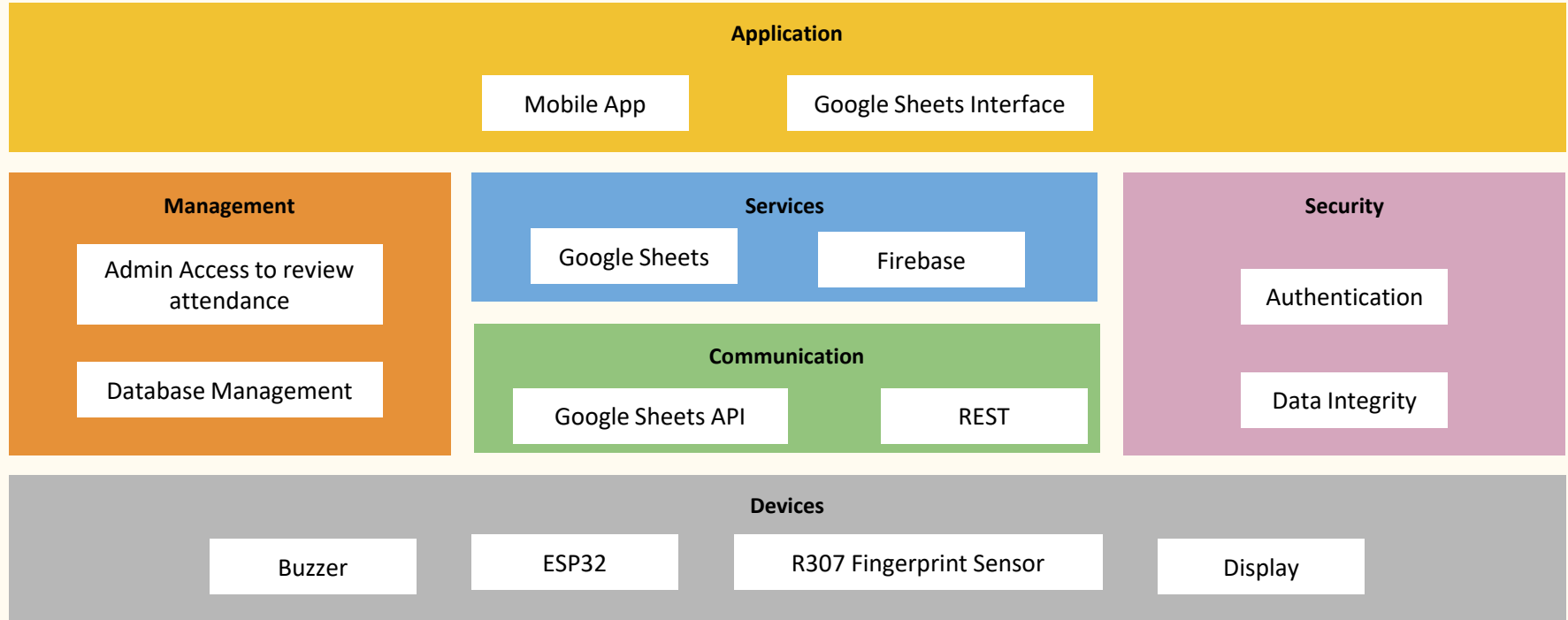


7. Functional View Specification

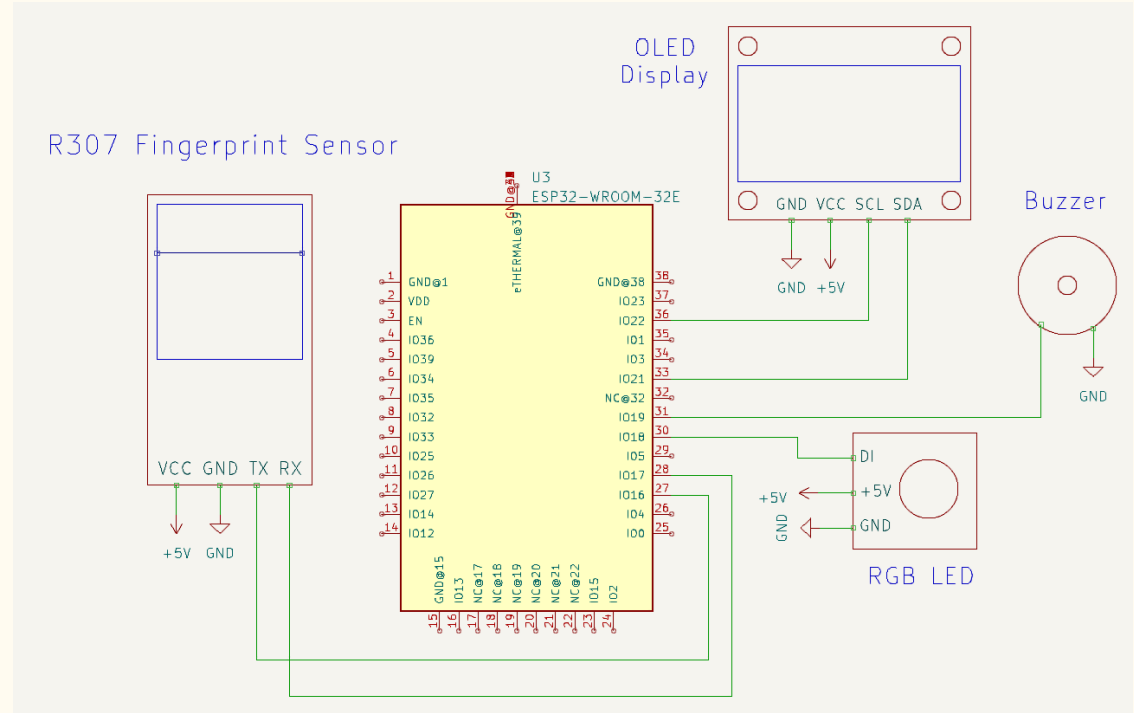


8. Operational View Specification

- **Normal Operation:** Fingerprint scans log times; attendance data syncs in real-time.
- **Error Handling:** Wi-Fi connectivity issues prompt reconnection.
- **Maintenance:** Add new student records in Firebase.



9. Device & Component Integration



- **ESP32:** Interfaces with fingerprint sensor for biometric input.
- **Firebase:** Central storage for student data.
- **Google Sheets:** Manages attendance records, displaying data in a structured format.

10.Application Development


Mobile App:


- Purpose: Simplify student registration and attendance management.
- Backend: Firebase manages data sync and storage.


Google Sheets:


- Purpose: Stores attendance logs (fingerprint IDs, timestamps, attendance status).
- Backend: Python Script to enter attendance status on a particular date and calculate overall attendance.

SignUp

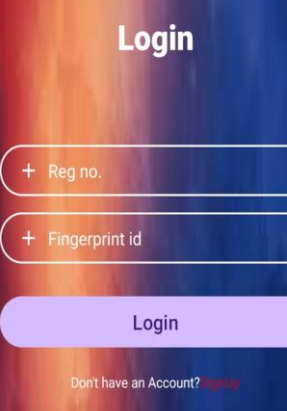
 Name

 Reg no.

 Fingerprint ID

 Password

Register




Login


+
Reg no.


+
Fingerprint id

Login

Don't have an Account?
[Sign Up](#)



 [Click here to access Google Sheets](#)

 Login Successful!

Attendance

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	A	B	C	D	E	F	G	H	I	J
	fing-id	name	student-id	student-email	in-time	out-time	percentage	09/11/2024	10/11/2024	12/11/2024
1	1	Flavia Saldanha	211021007	fsaldanha_b21@el.vjti.ac.in	21:43:23	22:49:00	100.00%	P	P	P
2	4	Charles Bass	211060069	cbbass_b21@el.vjti.ac.in	20:28:19	22:53:02	33.33%	A	A	P
3	5	Nathaniel Archibald	211060007	nharchibal_d_b21@el.vjti.ac.in	20:28:19		33.33%	A	P	A
4	3	Biswal Waldorf	211061011	bwaldorfd_b21@el.vjti.ac.in	20:28:19	22:53:10	66.67%	P	A	P
5	2	Vanessa Abrams	211021010	vaabrams_b21@el.vjti.ac.in	20:28:19	22:48:49	100.00%	P	P	P
6	6	Daniel Humphrey	211060001	drrumphre_y_b21@el.vjti.ac.in	20:28:19		66.67%	P	P	A
7	7	Serena Van Der Woodsen	211061022	swwdwoodsen_b21@el.vjti.ac.in	20:28:19	22:52:55	66.67%	P	A	P
8	8	Damien Dalgaard	211060072	ddalgaard_b21@el.vjti.ac.in	20:28:19		33.33%	A	P	A

Thank You

