SSIP

Sarvajanik College of Engineering & Technology

Department of Electronics & Communication Engineering

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Idea Pitching – Round 1

CampusPulse

BLE-Based Student Tracking & Attendance System

OUR TEAM

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Background & Motivation

- During a regular lecture, we noticed that 5–10 minutes of class time was spent every day just marking attendance.
- Sometimes it was roll calls, sometimes signatures, sometimes proxy attendance.

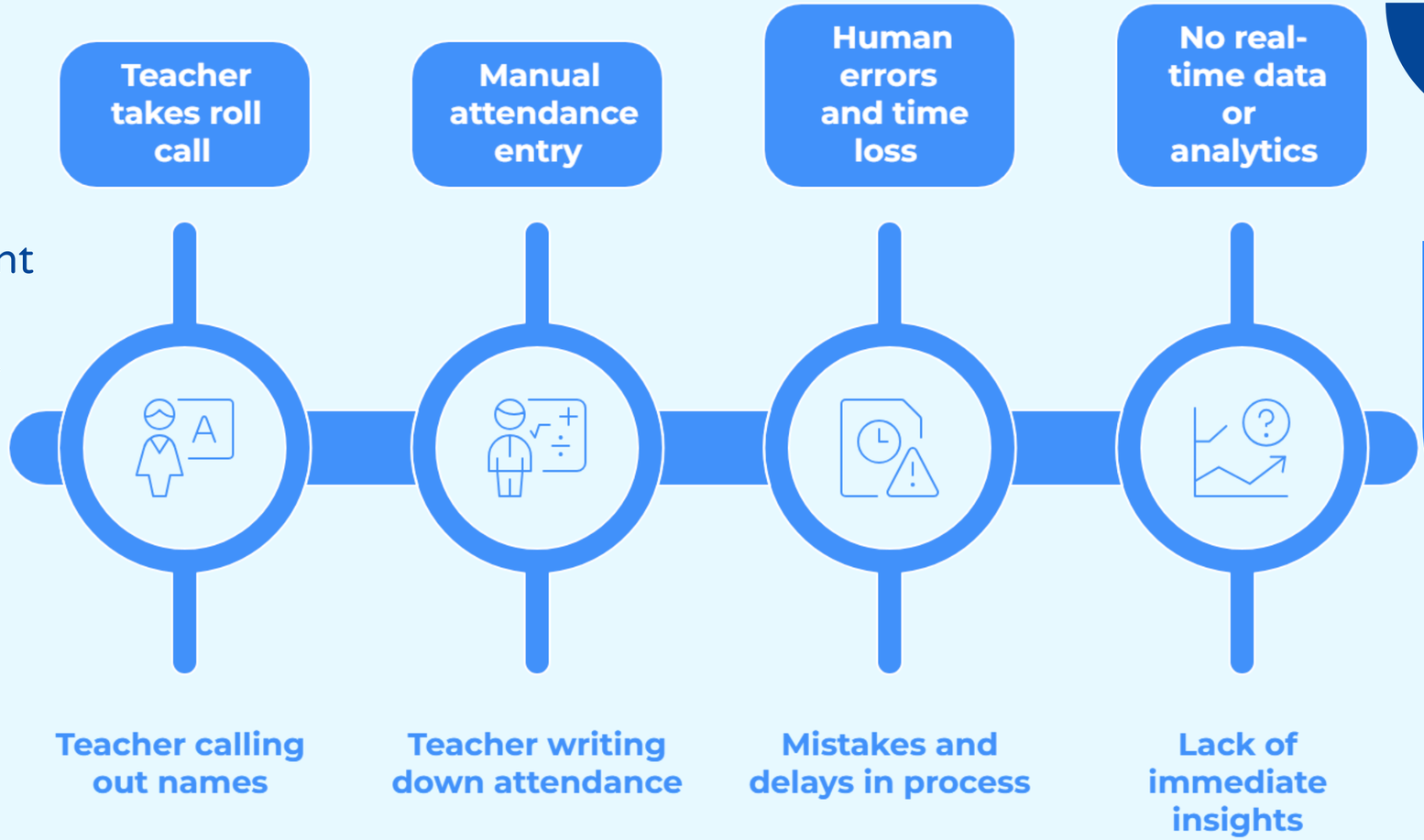
but one thing was constant: time loss and unreliable data.

We asked a simple question:
What if attendance could happen automatically, without interrupting teaching or learning?

Problem Statement

Traditional attendance systems suffer from major limitations:

- Manual attendance is time-consuming and error-prone
- No real-time visibility of student presence
- No data for room utilization or campus planning
- No insights for energy optimization or safety management



As a result, institutions miss out on valuable data that could improve efficiency, planning, and decision-making.

Existing Solutions & Their Limitations

Current attendance systems attempt to solve the problem, but each has significant drawbacks:

- RFID cards: Require manual swiping and active participation
- Biometric systems: Expensive, slow, and raise hygiene concerns
- Camera-based systems: High cost and privacy issues
- GPS-based apps: Inaccurate indoors and drain battery

Conclusion:

No existing solution provides automatic, indoor-accurate, and scalable attendance.

OUR SOLUTION - SMART ID TAG

Smart ID Tag is a BLE-based automatic attendance and indoor tracking system designed for educational campuses.

- Works automatically in the background
- No manual interaction required from students or faculty
- Accurate indoor presence detection
- Real-time data stored on the cloud

Key Advantage:

The system operates silently without interrupting teaching or learning.

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Web Dashboard

The web dashboard displays real-time attendance data.

5

Cloud Backend

The server sends processed data to the cloud backend (Firebase).

4

Node.js Server

The Node.js server subscribes to MQTT data and processes it.

3

MQTT Broker

The MQTT broker receives and distributes data to subscribers.

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ESP32 Receiver

ESP32 nodes receive BLE signals and publish data via Wi-Fi.

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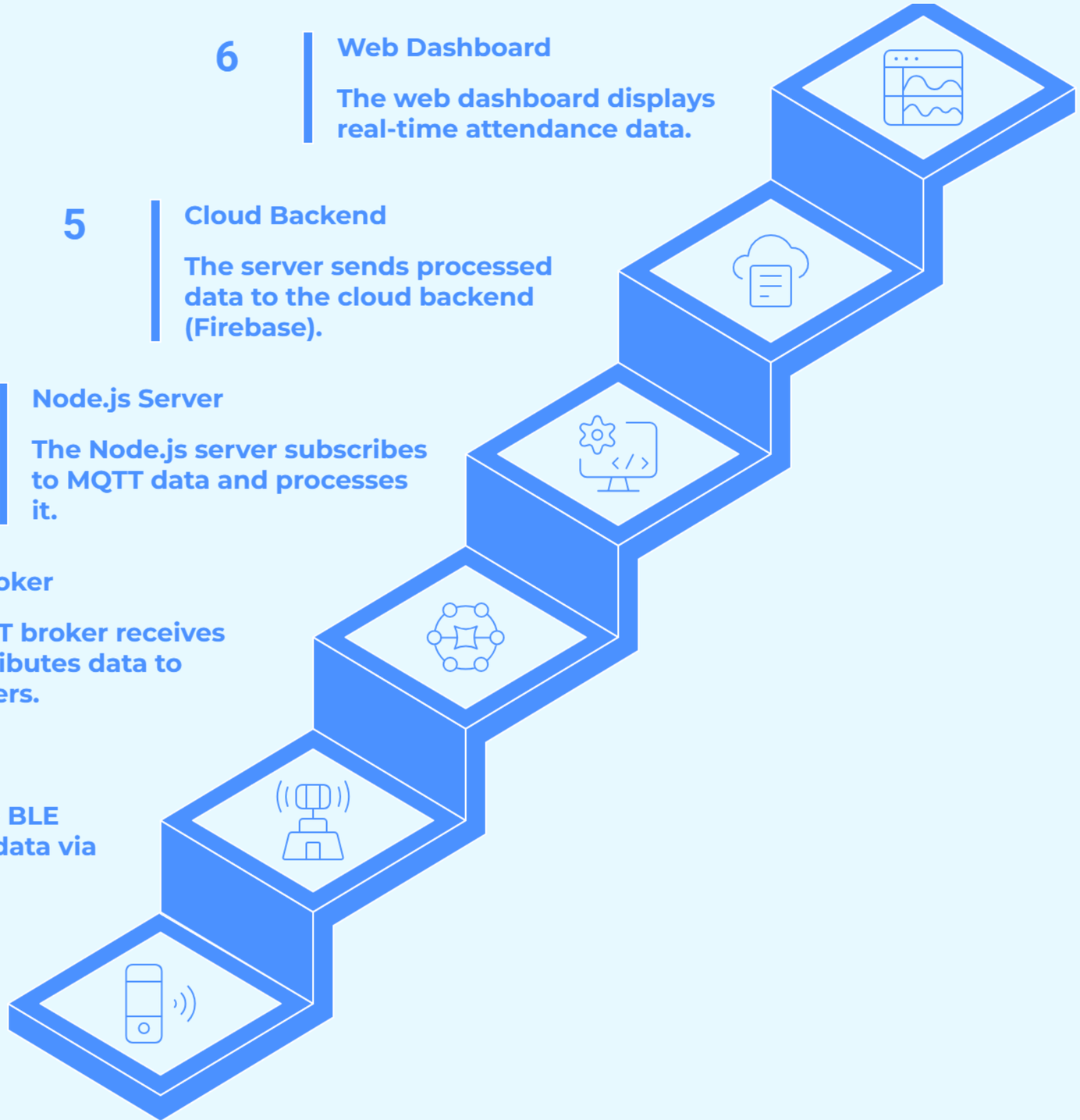
BLE Signal

Smart ID tags or mobile phones broadcast BLE signals.



Current Prototype & Implementation

- BLE advertising implemented using Smart ID Tag / Mobile Phone
- ESP32 configured as BLE receiver node
- Attendance data published using MQTT protocol
- Node.js backend subscribes to MQTT topics and processes data
- Processed data stored in Firebase cloud
- Web dashboard displays real-time attendance and location

Why Bluetooth Low Energy (BLE)?

- Low power consumption—suitable for continuous presence detection
- Accurate indoors—works reliably where GPS fails
- Cost-effective—ideal for large-scale campus deployment
- No user interaction required—works automatically in the background.
- Widely supported—compatible with ESP32 and smartphones

Beyond Attendance

Campus Optimization

- Classroom utilization analysis
- Identification of underused spaces
- Smarter timetable planning

Energy Optimization

- Automatic control of lights based on occupancy
- Reduced electricity wastage
- Lower operational costs

Safety & Security

- Student presence tracking during emergencies
- Crowd density monitoring
- Restricted area alerts

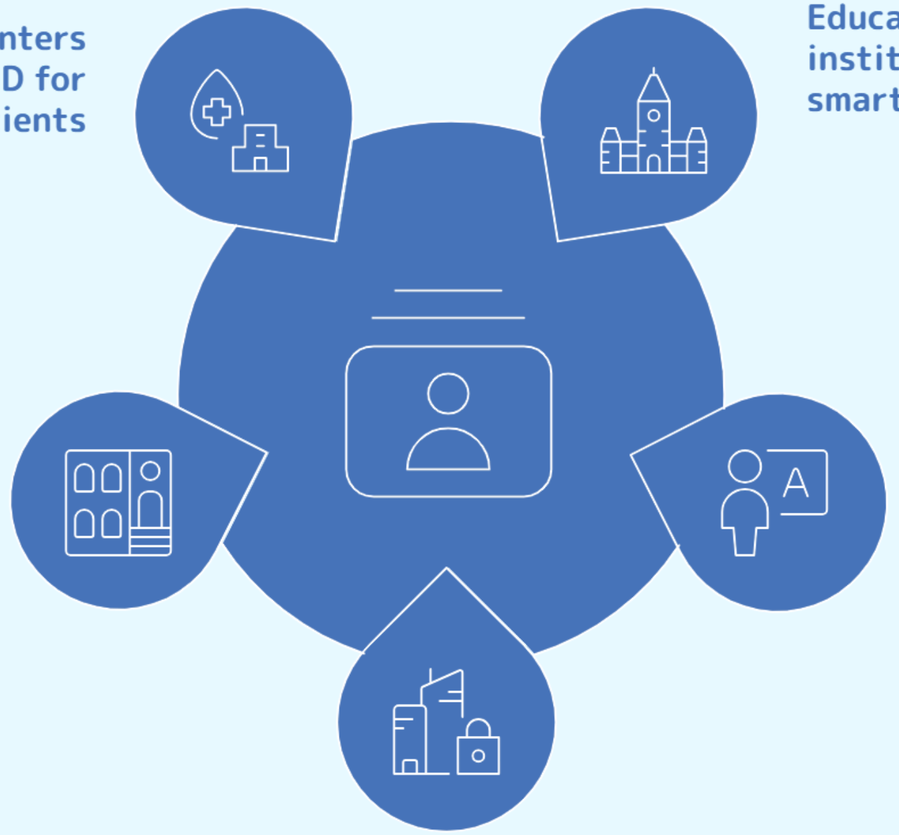
Target Market

Hospital Building

Healthcare centers with smart ID for staff and patients

College Building

Educational institutions with smart ID systems



Hostel Building

Residential facilities with smart ID for entry

Classroom

Learning environments with smart ID integration

Office Building

Corporate campuses utilizing smart ID for access

Market Opportunity

- Attendance management is a mandatory operational requirement for all educational institutions
- Current systems focus only on record keeping, not on data utilization
- Institutions are increasingly adopting IoT and smart campus technologies
- Presence data can be leveraged for academic monitoring, infrastructure planning, and safety
- A single deployment can serve multiple use cases, increasing long-term value

Business Model

Hardware Component:

- BLE receiver nodes deployed across campus
- Smart ID tags or mobile-based BLE advertising

Software Component:

- Web dashboard for attendance and analytics
- Cloud backend for data storage and processing

Revenue Streams:

- One-time hardware installation cost
- Annual subscription for software and analytics
- Maintenance and technical support

Pricing Approach:

- Institution-based licensing or per-user subscription model

Competitive Advantage

- Fully automatic attendance, no user action required
- Accurate indoor presence detection
- Privacy-friendly compared to camera-based systems
- Low power and cost-effective solution
- Same data pipeline supports multiple applications

Differentiator:

Attendance is treated as data, not just a record.

Our Requirement & Budget Breakdown

Component	Name & Description	Quantity	Cost per Unit (₹)	Total (₹)
BLE Receiver Nodes	Nordic nRF52840 / nRF52-based BLE Gateway Modules	10 units	2,500	25,000
BLE Tags (Advertisers)	BLE Beacon Tags (nRF52-based, key-fob type)	10 tags	1000	10,000
Local Server & MQTT Broker	Raspberry Pi 4 Model B (8GB RAM)	1 unit	7,500	7,500
Local Network Infrastructure	Wi-Fi Routers (Campus local network)	2 units	3,000	6,000
Cloud Backend & Database	Firebase (Firestore, Hosting, Auth) – 2 years	—	—	5,000
Power & Accessories	Power adapters, SD cards, cables, enclosures, mounts	—	—	1,500

Total Estimated Budget → ₹55,000

Conclusion

- Smart ID System enables automatic, hands-free attendance
- BLE and MQTT ensure low-power, reliable, and scalable operation
- The system converts attendance into real-time, usable data
- Designed for smart campuses and future expansion
- Ready to move from prototype to pilot deployment

Thank you

Any Questions ?

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