Smart Parcel Box

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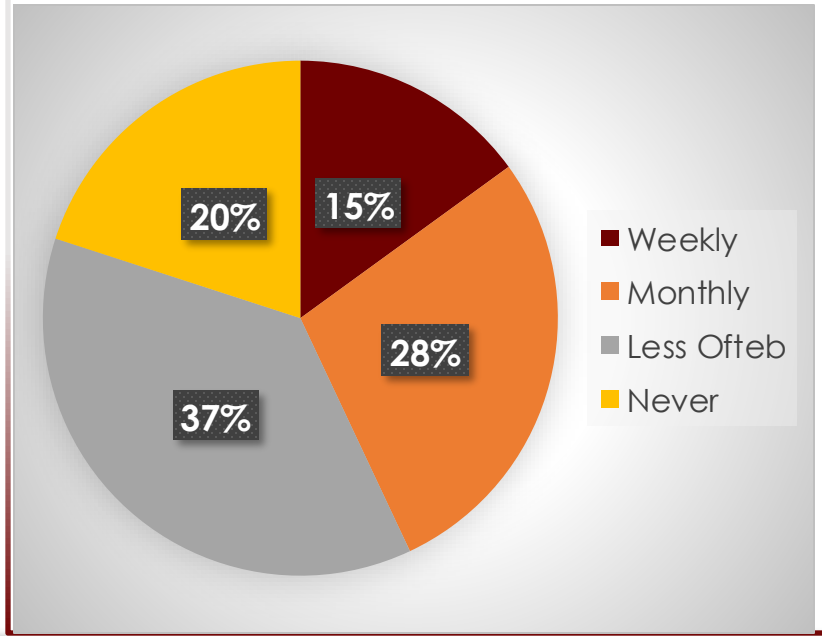
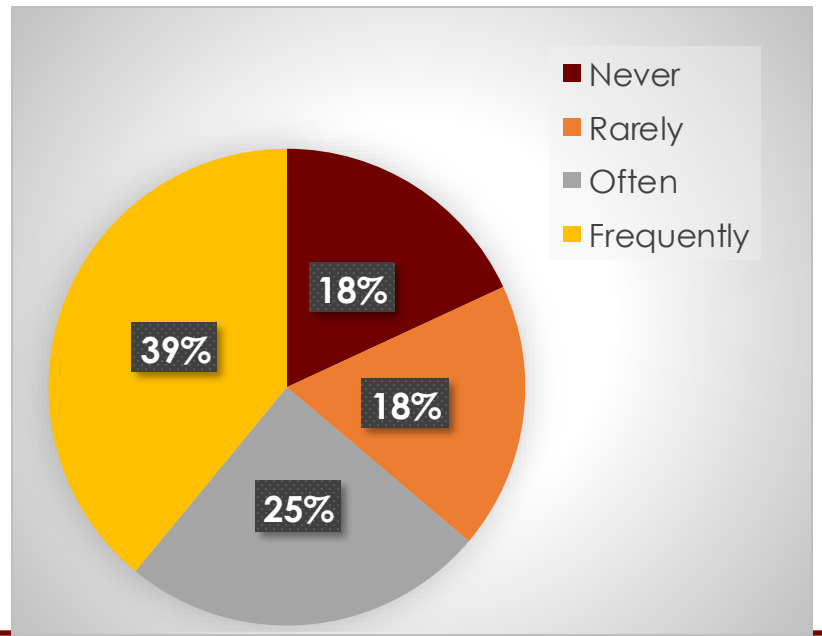
EMPATHISE

With online shopping demand rising, unattended parcel deliveries often lead to missed deliveries, package theft, and repeated redelivery attempts.

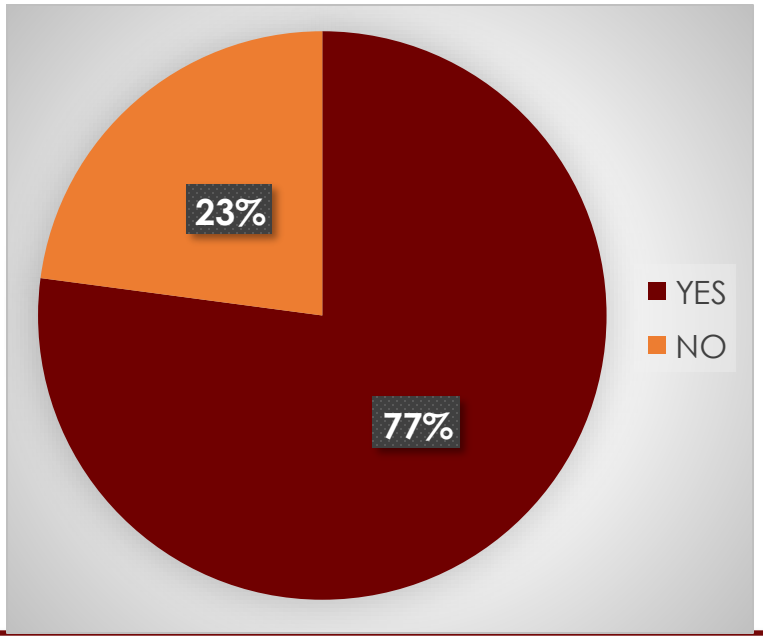
How often adults do online shopping?



How often were you not available while delivery happens?



Have you ever experienced loss of parcels?



DEFINE

Narrowing Down The Problem

It all concentrates down to..

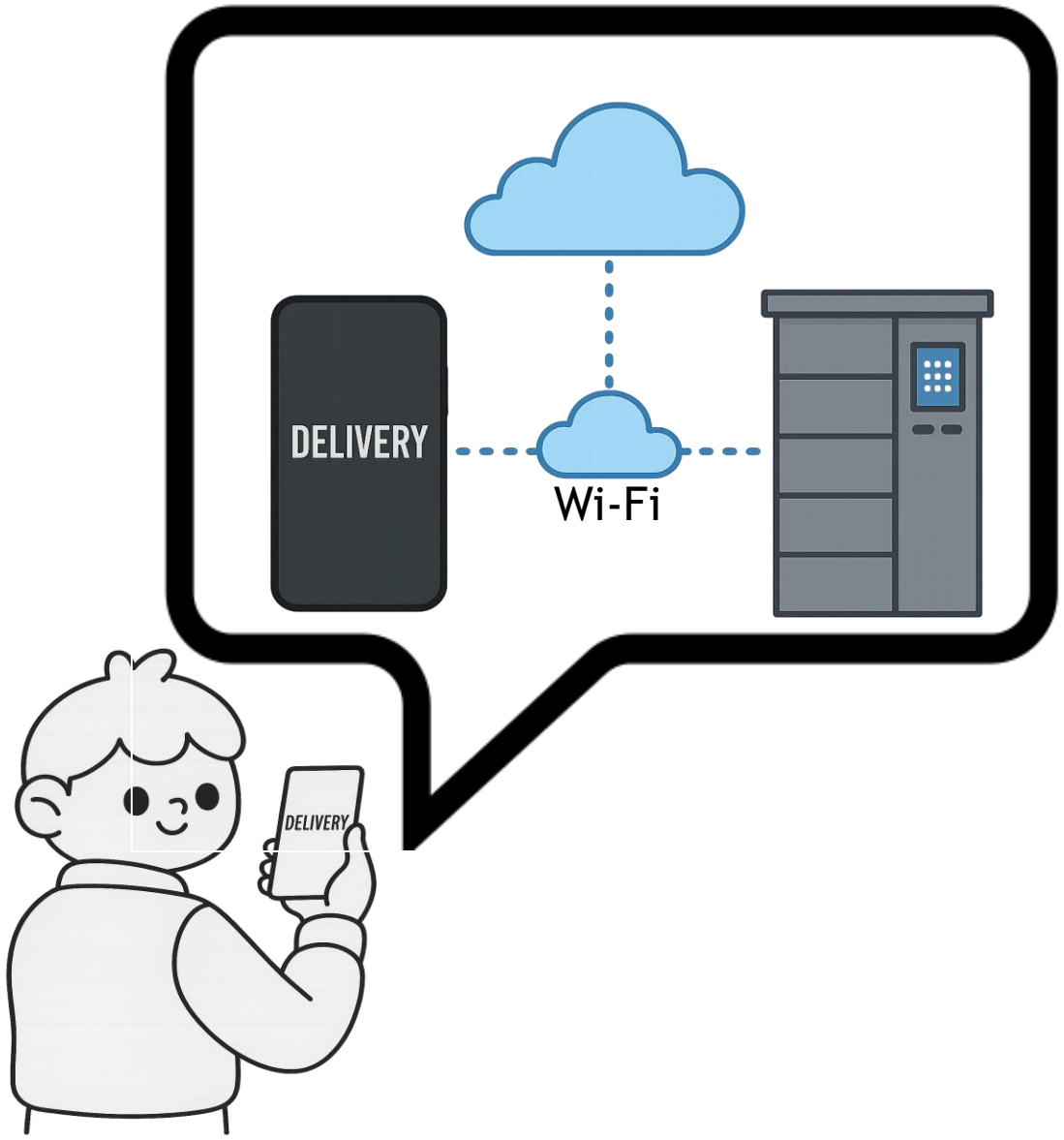
1. Missed deliveries delay orders and inconvenience consumers.
2. Unattended parcels face a higher risk of theft.
3. Repeated deliveries waste time, fuel, and effort of delivery agents.
4. Financial losses of retailers from redelivery costs.
5. No secure, efficient system for unattended deliveries.

Bring security, efficiency and control in the hands of users.

IDEATE

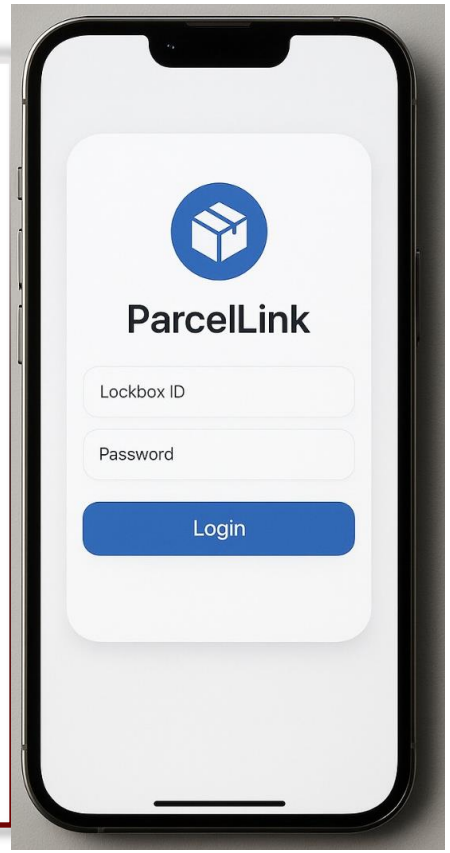
A mobile app connects to a secure cloud firewall and a smart parcel box.

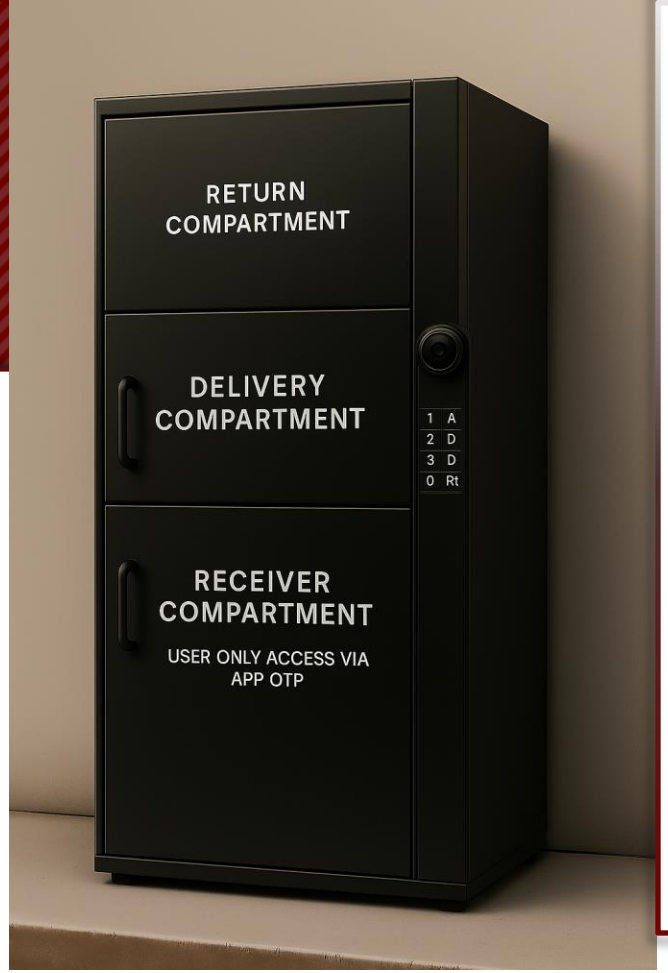
The system enables users to monitor and manage parcel deliveries remotely, ensuring safe and unattended deliveries.



PROTOTYPE

- Features
1. Add new delivery
2. See live feed
3. View parcel status
4. Payment option
5. Authenticate delivery



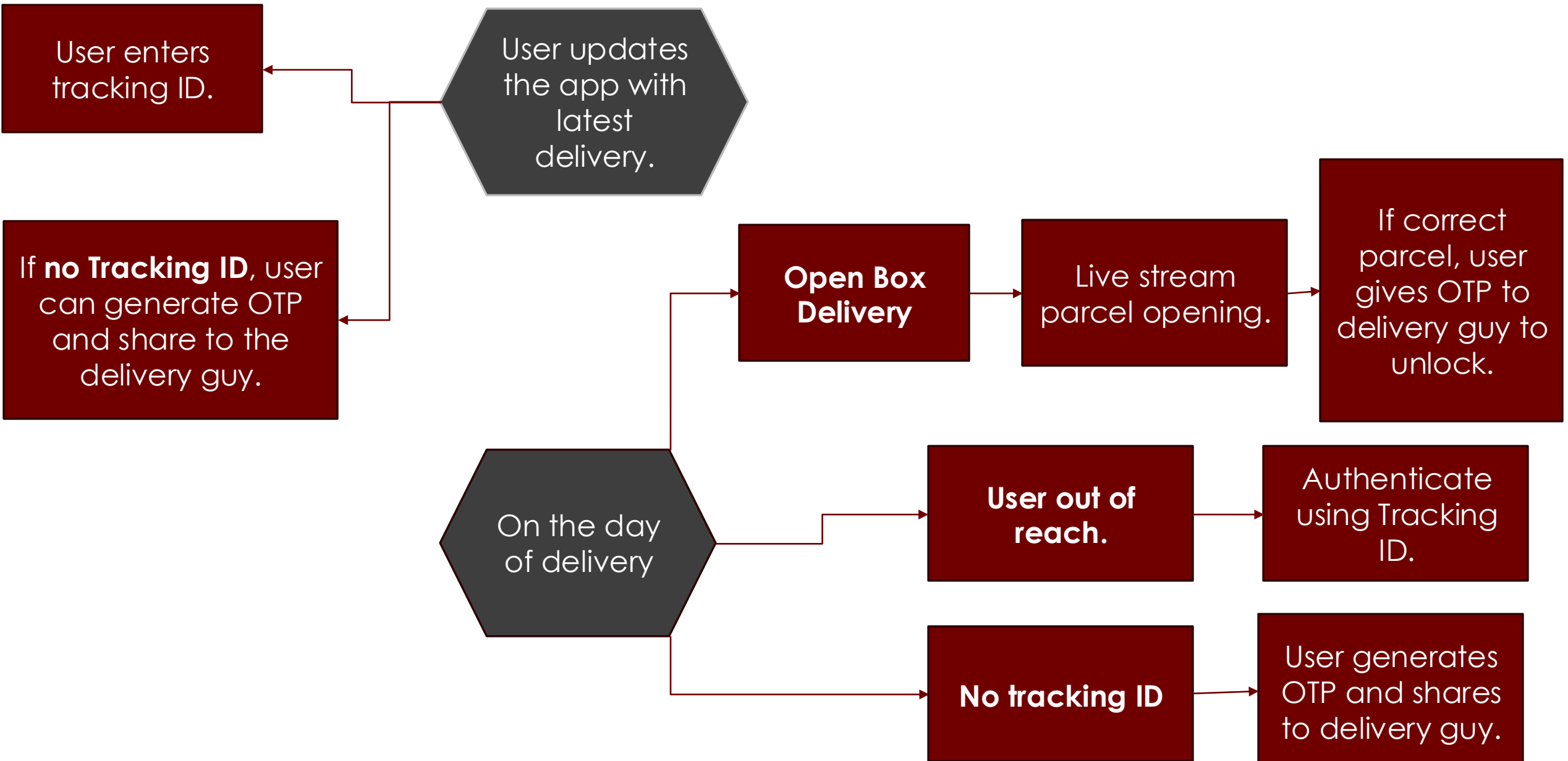


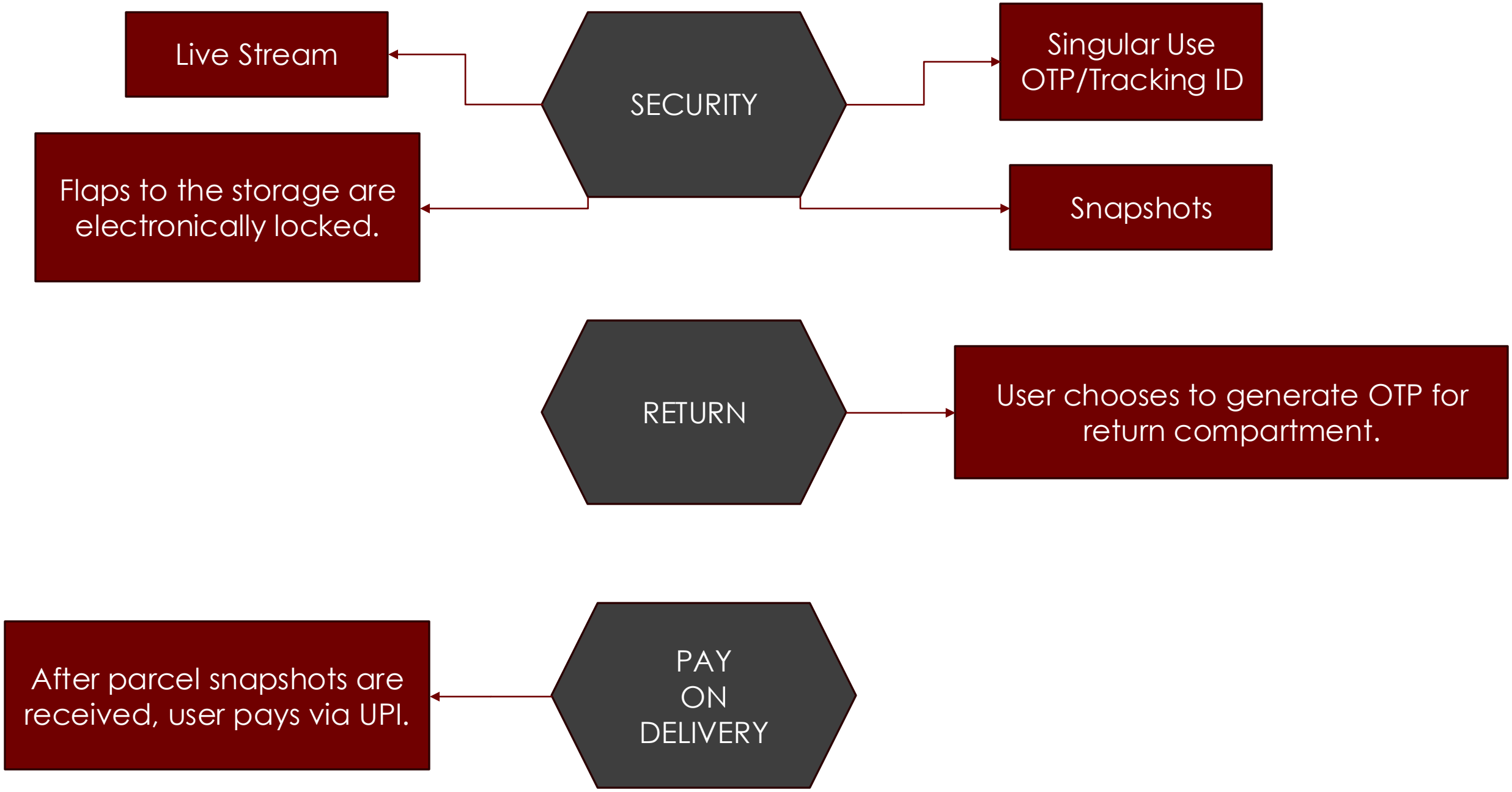
- Features
1. User-Authenticated Access
2. Secure Delivery
3. Compartmentalised Storage
4. Return Management
5. Multiple deliveries
6. Deep Sleep mode for power optimization.

Introducing **DELIFAST :**

Dynamic Electronic Locker for Intelligent Fast and Secure Transfer

How the process works?




Live Stream
SECURITY
Singular Use OTP/Tracking ID
Flaps to the storage are electronically locked.
Snapshots
RETURN
User chooses to generate OTP for return compartment.
After parcel snapshots are received, user pays via UPI.
PAY ON DELIVERY

BOX DESIGN 1 : THE CONVEYER BOX

Delivery Verification Completed.

ESP32 activates stepper motor.

Tray moves from compartment A to B.

IR sensor detects tray near smart door.

ESP32 triggers servo -> Door opens.

Tray moves into compartment B.

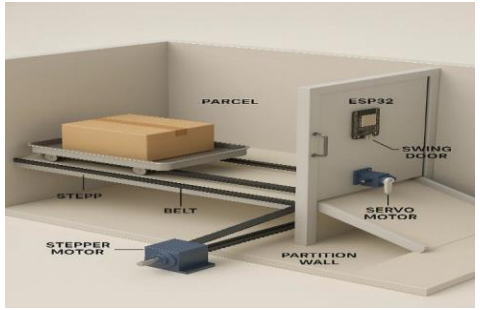
Parcel slides down ramp.

Tray hits and limit switch -> Pauses

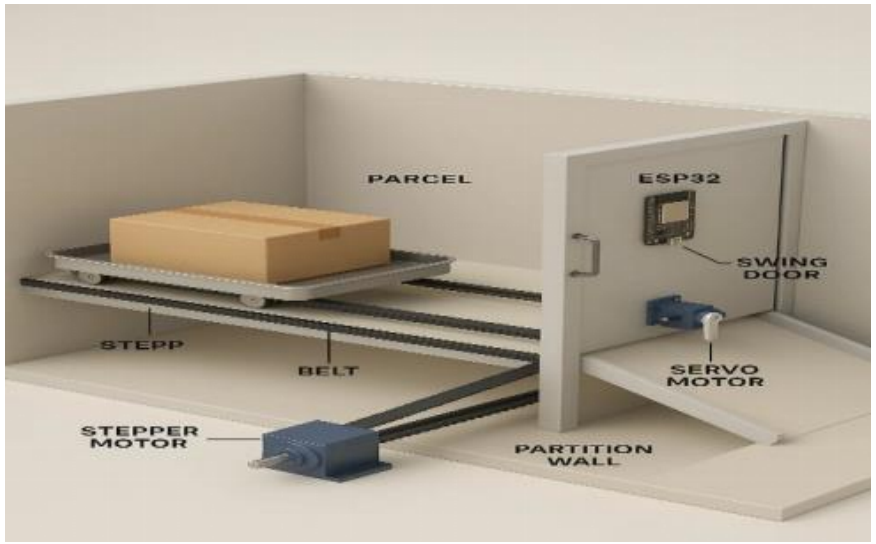
Tray returns to starting position.

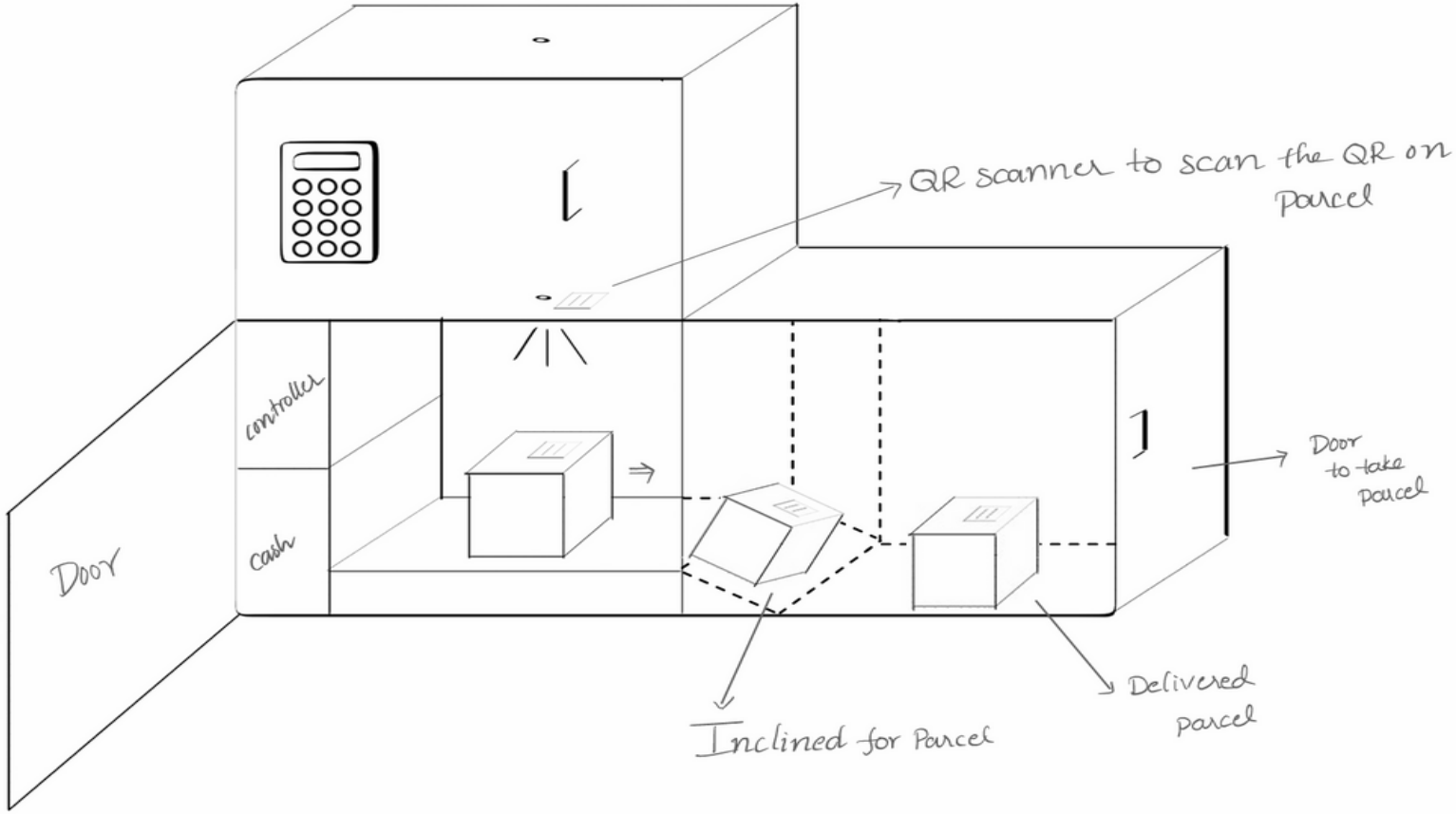
Door closes automatically after tray pauses.

Ready for next delivery cycle.

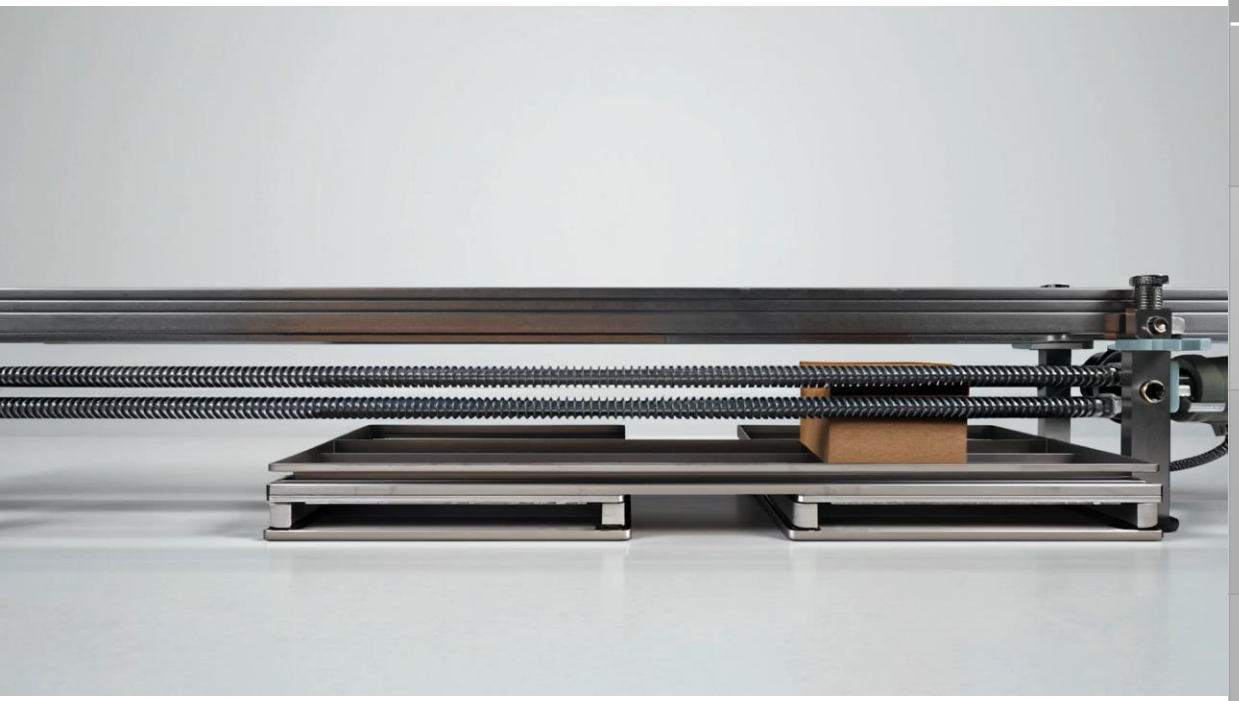


The Conveyer Box



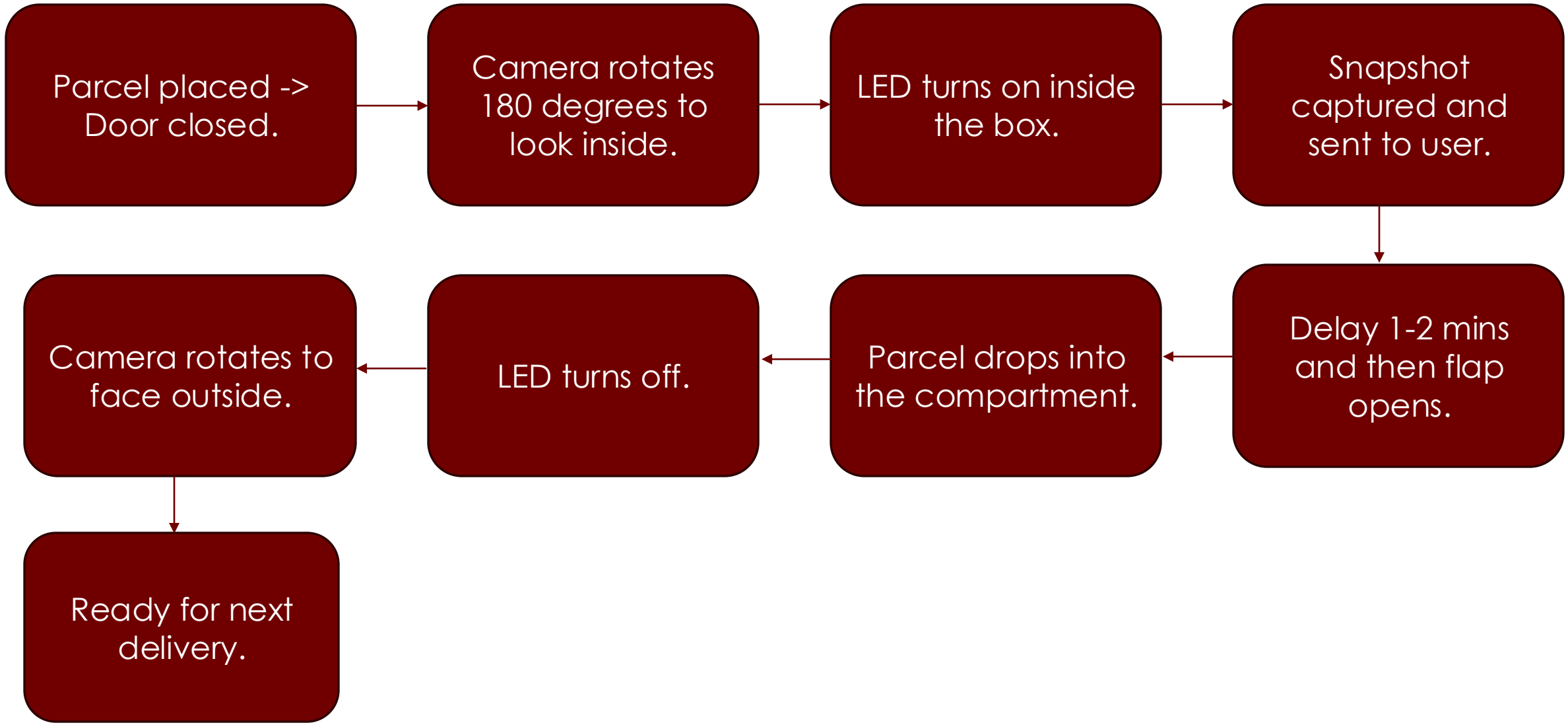


The Conveyer Box

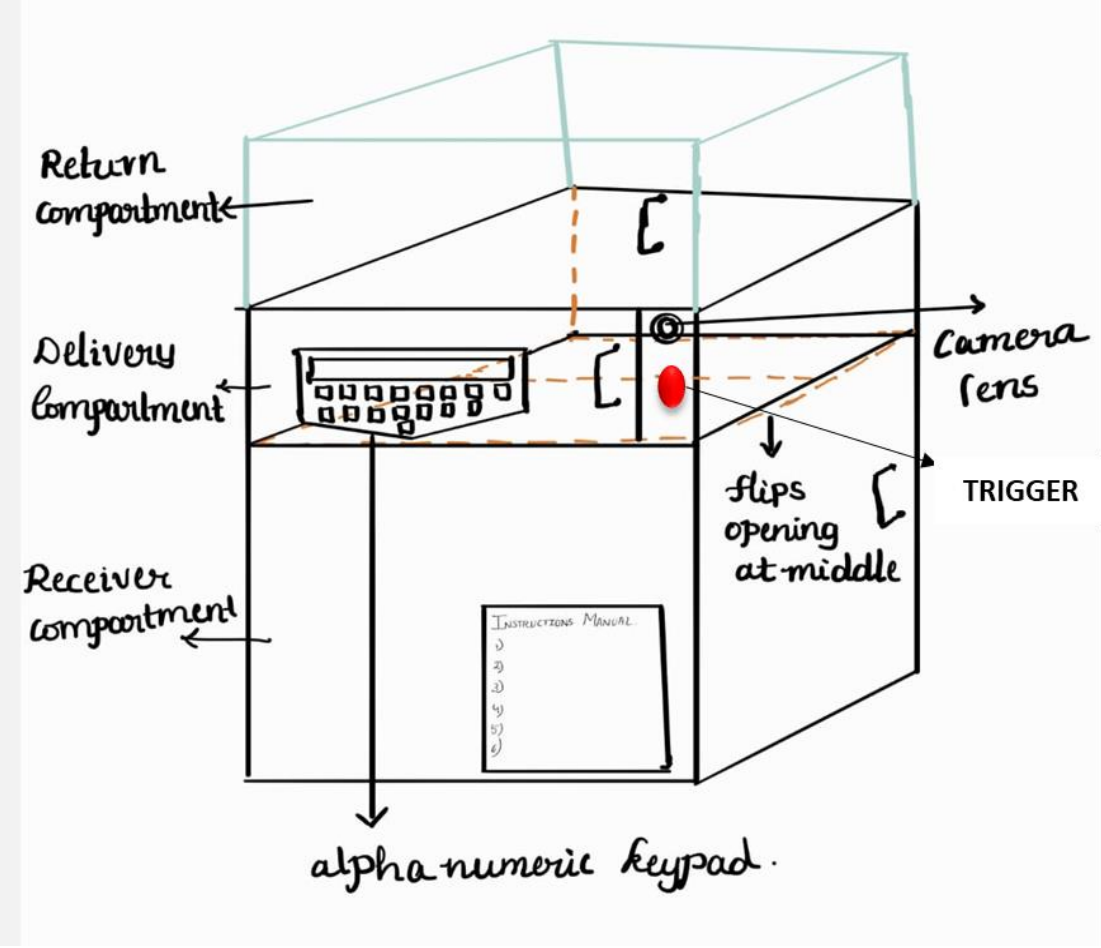


PROS	CONS
Fragile items can be handled with care.	Setup requires more horizontal space.
Can accommodate greater no. of parcels.	Add more technical complexity for handling conveyer.
	Prone to motor or belt failure leading to jamming.
	Cost inefficient.

BOX DESIGN 2 : THE DROP-BOX

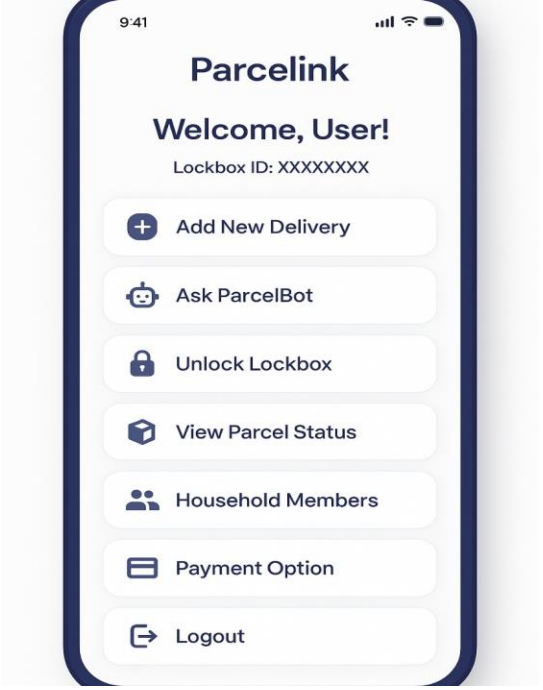


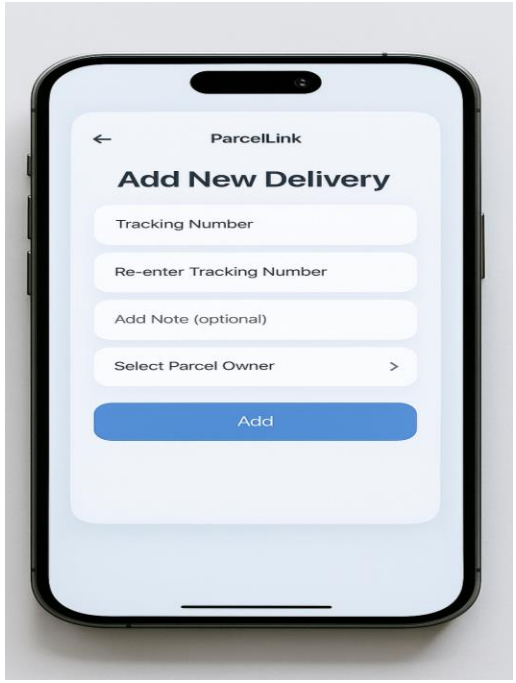
BOX DESIGN 2 : THE DROP-BOX

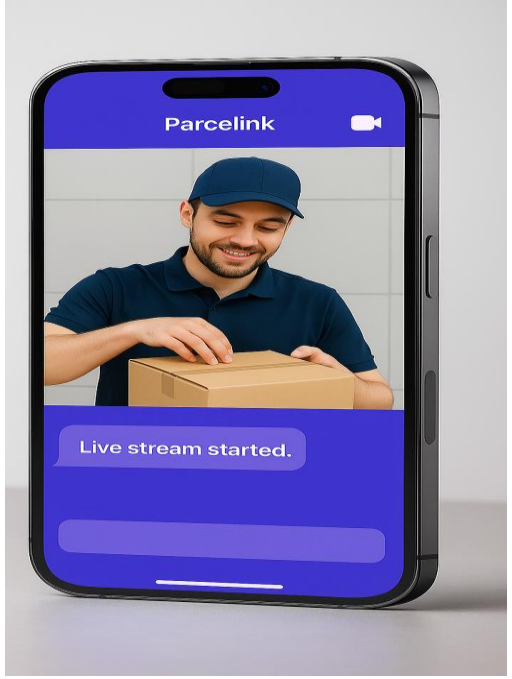


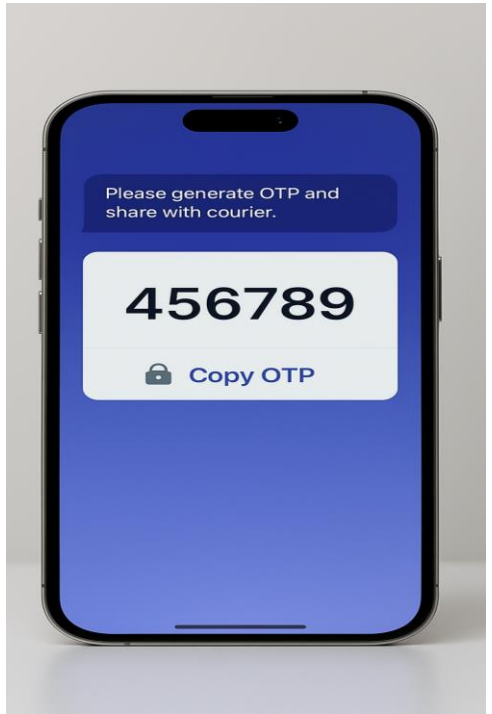
PROS	LIMITATIONS
Cost efficient	Parcel Size Limitation
Motorized Dual Locking System	Non-Supportive for multiple Returns
Surveillance-Enabled	
Return Dispatch Compartment	
Power-Efficient Architecture	
Space Efficient	


ParcelLink
Lockbox ID
Password
Login

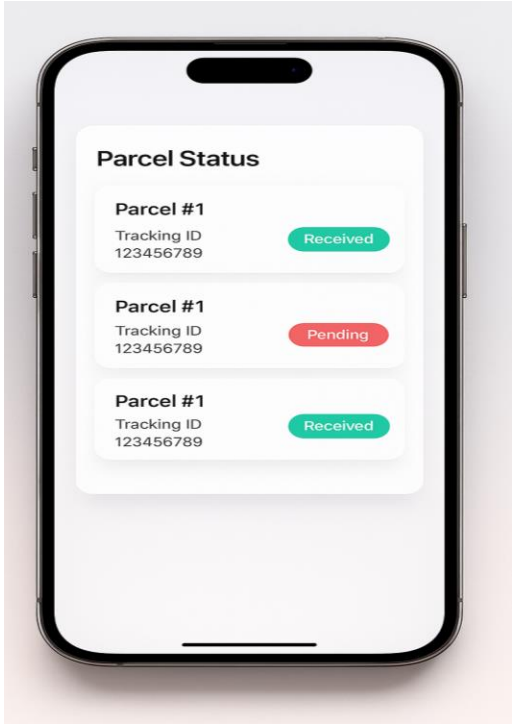

9:41
Parcelink
Welcome, User!
Lockbox ID: XXXXXXXX
Add New Delivery
Ask ParcelBot
Unlock Lockbox
View Parcel Status
Household Members
Payment Option
Logout


ParcelLink
Add New Delivery
Tracking Number
Re-enter Tracking Number
Add Note (optional)
Select Parcel Owner
Add


Parcelink
Live stream started.


Please generate OTP and share with courier.
456789
Copy OTP


Parcelink
OTP verified.
Box opened
successfully!


Parcel Status
Parcel #1
Tracking ID
123456789
Received
Parcel #1
Tracking ID
123456789
Pending
Parcel #1
Tracking ID
123456789
Received

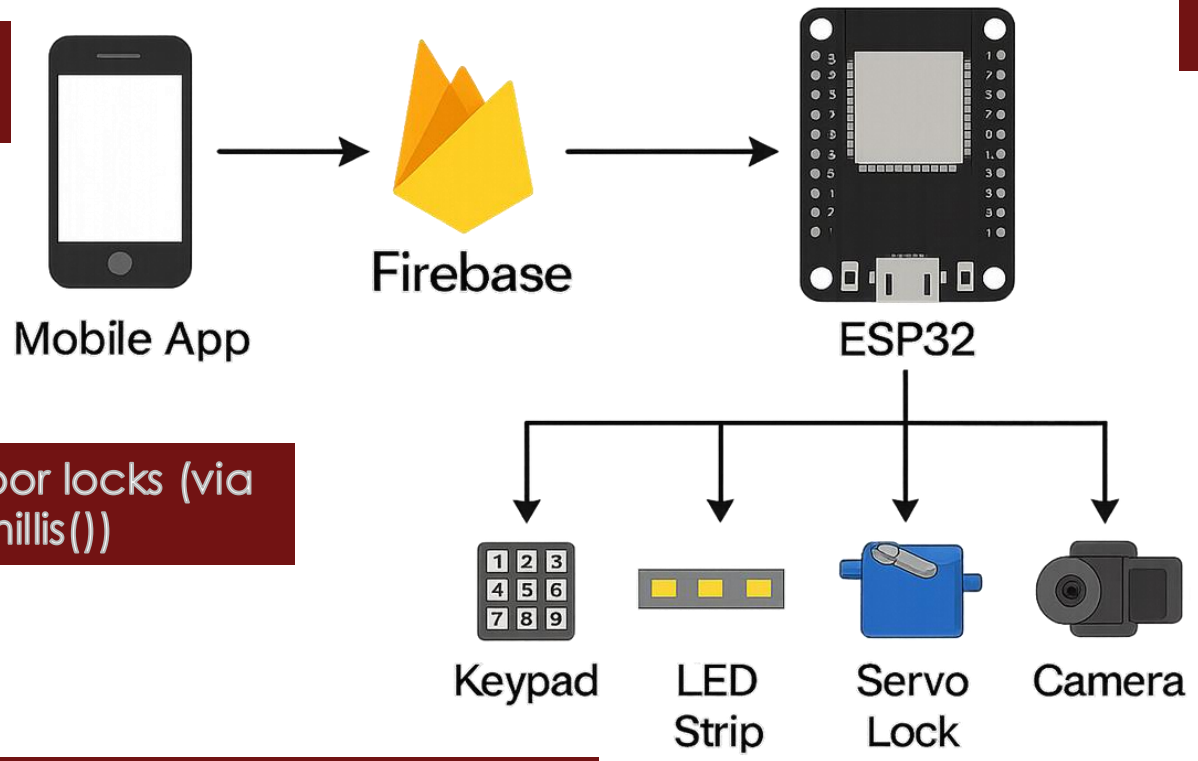

ParcelBot
Hey! How can I help you today?
Where is my parcel right now?
Sure! Please share your tracking ID.
Message

Backend Logic

Firebase: Storage, Auth, Sync, Validity.

ESP32 connects to WiFi & Firebase (Via Firebase_ESP_Client.h)

App writes OTP/Tracking ID to Firebase



LED glows briefly after door locks (via setPixelColor() + millis())

Servo mounted camera rotates 0° → 180° post-lock for capture, then resets

Keypad input via Keypad.h; OTP match → proceed

Servo unlocks box (0° to 90° using Servo.h)

TESTING

PIR SENSOR

False triggers due to unnecessary motion
Unwanted camera wakeup

QR SCANNER

needs high-quality cameras
Not reliable, costly, power-heavy for our use case.

FRAGILE ITEMS

Handled with pre-packed safety, foam inserts Ensures protection of delicate goods.

Trigger Mechanism

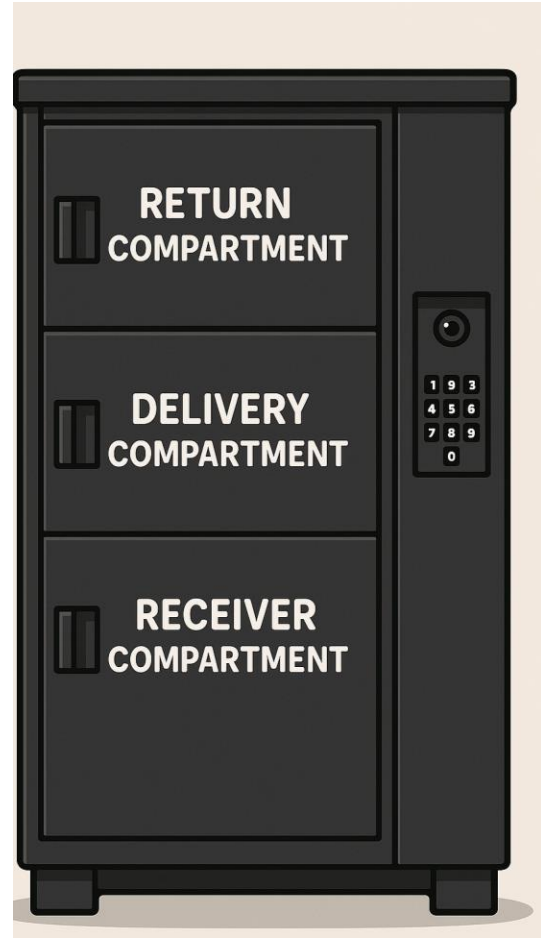
Intentional wake-up and returns to deep sleep saving power and avoiding false alerts.

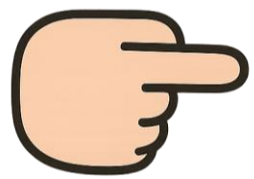
CASH COMPARTMENT

Avoids Handling Cash

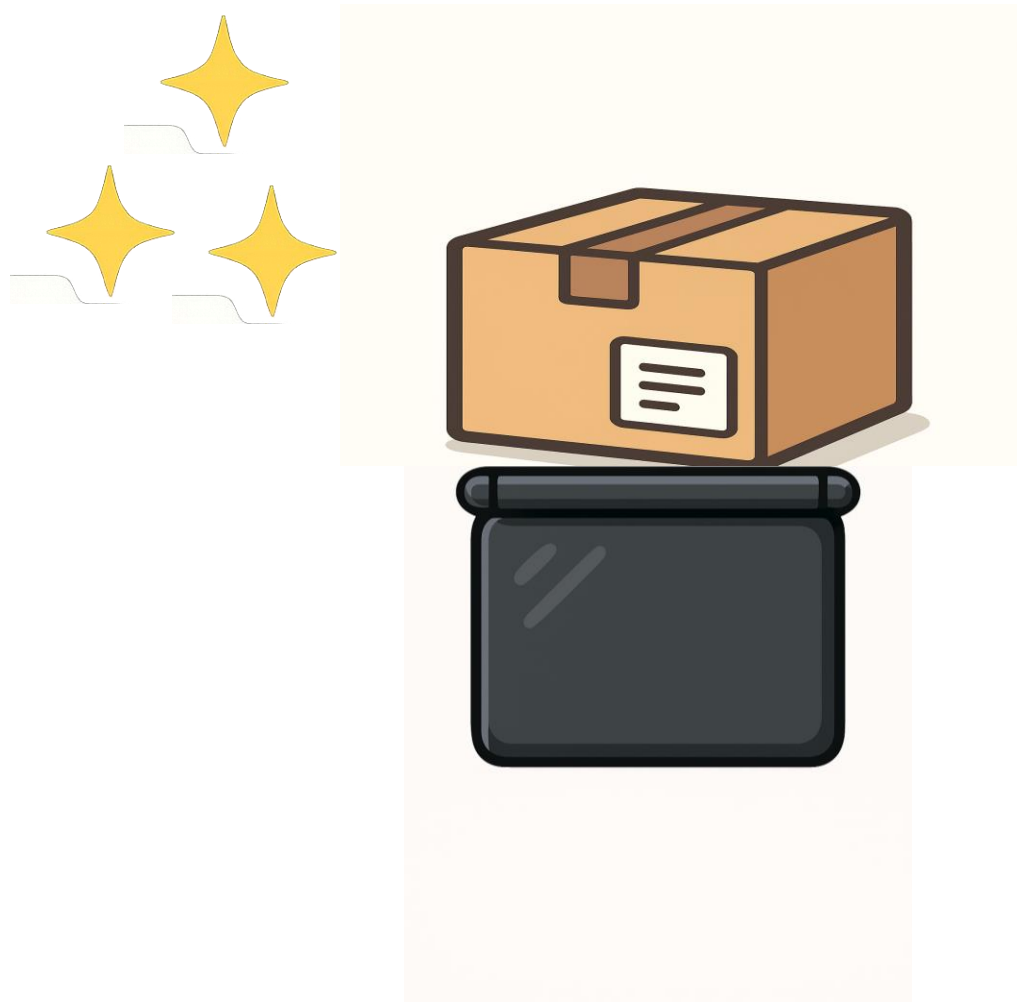
Component	Description	Cost
ESP-32 CAM MODULE MCU	MAIN CONTROLLER	₹599 – 1,049
Keypad 4x4 (8 pins)	For OTP/tracking ID entry (rows + columns)	350
External Camera (OV2640-CAM)	Use an ESP32-CAM for rotating cam function	
SG90 Micro Servo	Rotate between outside view and inside view	₹72–₹147
MG90S Servo (Servo Motor for Flap)	Move parcel from Compartment A to B	₹253
POLYCARBONATE	Main enclosure	400-500
SOLENOID Lock – A	Unlock Delivery Compartment A	100-150
SOLENOID Lock – B	Lock Compartment B	100-150
RELAY MODULE (2-4 CHANNEL)	To drive locks/motors safely	₹60 – ₹120
SOLENOID Lock – Return Box	Lock Return Box	100-150
MALE AND FEMALE JUMPER WIRES	For connecting modules, sensors, and GPIO pins	₹60 – ₹100 (pack of 40–60)
LED Inside(5V White) Compartment A	Turns on while recording inside Compartment A	299
BREADBOARD/PCB	For prototyping or permanent circuit mounting	₹100 – ₹200
Power Supply (Vin/3V3)	Use 5V for motors/lock (via external supply)	300-800
Foam Inserts / Padding	Shock protection for delicate items	100-200

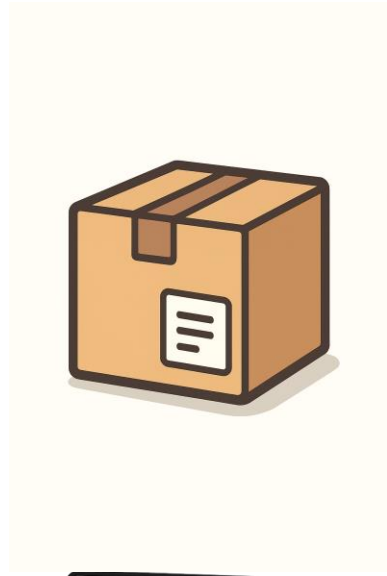
TOTAL COST ~ 4400


RETURN
COMPARTMENT
DELIVERY
COMPARTMENT
RECEIVER
COMPARTMENT
1 9 3
4 5 6
7 8 9
0




1
2
abc
3
def
4
ghi
5
jkl
6
mno
7
pqrs
8
tuv
9
wxyz
0





THANK YOU