Smart Lock Network

lockNET

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1 Customer

Our target market is people in communal living spaces such as houses or shared apartments, and who are looking for greater control over the security of their own rooms by using a central system with credentials to allow access through doors as opposed to a simple key mechanism.

2 Value

The first benefit is the added security of the doors via two-factor authentication. Each door can only be unlocked either via something on you (i.e. NFC via a phone) or a part of you (i.e. fingerprint). This method surpasses using a physical key because it can not be as easily duplicated or lockpicked, and is also convenient as the odds of losing a key are much greater than losing a smartphone or your fingerprints. The state of the door can also be sent to the owner, so if they forgot to lock it they can just use their phone to do so (or set up autolock functionality).

The second benefit is that there is more freedom in terms of access. Each door can have both blacklists and whitelists to outright deny or accept people, and if someone's on neither, they can request access remotely instead, much quicker than waiting for them to come home.

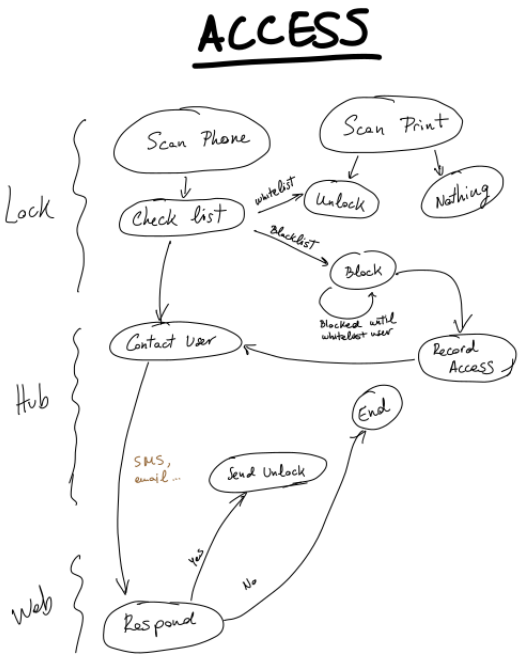
3 Approach

The top level design is of a central hub with a number of nodes connected. The hub is what allows users to communicate with the locks via a web interface. We only want the hub to store what is necessary, acting as a control station while each of the locks do most of the security part, making it much harder for someone to spoof access rights.

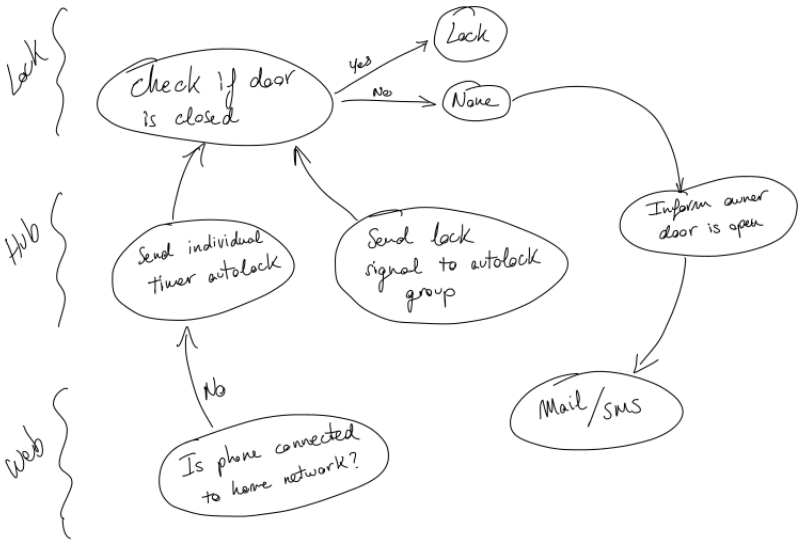
When a scan occurs, the Arduino will compare the ID with its internal whitelist and blacklist. If it's on the whitelist, the door will unlock. If it's on the blacklist, not only will the door not unlock, but a record of the attempted access is saved. If the ID is on neither list, the Arduino will inform the hub, which sends out a notification to the lock's owner requesting approval. Upon answer, the lock will unlock if approved. The request will also be recorded. If the scan is via fingerprint, then only the prints already saved are allowed, and no requests will be made if access is denied.

A similar notification method will be used to make changes to the locks. In order to allow equal ownership, if somebody wishes to change a common lock, they submit a request for the change, and the others must approve it first before it becomes implemented.

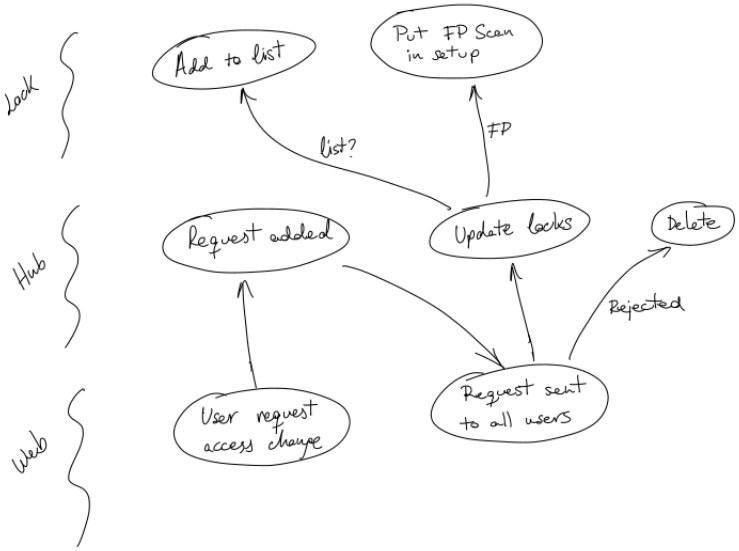
The following diagrams will showcase the control flow for the various operations that the system will perform:



AUTOLOCK



ADMINISTRATION



4 Physical Components

4.1 Hub

Quantity: 1
Base: **Intel Edison** (stock)
Attachments:

- LoRa transponder (∼$40)
- WiFi chip (already on board)

4.2 Lock

Quantity: 2
Base: **Arduino Uno** (stock)
Attachments:

- LoRa transponder (∼$40)
- 360° Servo motor (∼$14)
- Fingerprint scanner (∼$30)
- Physical lock (∼$10)
- NFC Scanner (∼$5)
- Magnetic contact switch (∼$4)

5 Potential Components

Instead of using regular Arduino Uno with the various sensors attached via IO pins, we would design a custom Arduino board with the LoRa transponder and NFC scanner as SMDs, and having dedicated pins for attaching the fingerprint scanner and servo.