***IOT First Assignment -*** Smart Lock Cylinder & Key

Project Name: Smart Lock Cylinder & Key

Participants: Moshe Rimok – 318358587

Product Description:

The product is a pair of a key and a lock cylinder. In contrast to the nowadays key and cylinder, those are “smarter”.  
The smart cylinder acts like a regular cylinder but has more capabilities and meets more advanced security principles.

The key has the same purpose as a normal key but has some sensors to communicate with the cylinder and to let the user some indications about the lock or key state.

Product Scope Description:

* Key:   
  The key looks like a normal key **except** for two things:

1. The head of the key is larger than the usual since it contains some sensors, a button, and a LED bulb.
2. The blade of the key is completely flat and smooth since the unlock process is verified by the cylinder sensors so there is no need for notches and ridges.

The key’s head contains a fingerprint scanner sensor on one side and a button on the other side.   
The button is used to temporarily activate the fingerprint scanner that and as a result it saves the keys’ battery life.  
To activate the fingerprint sensor the user needs to press and hold the button.  
To get an indication of the **latest used** cylinder lock state a single press is enough.  
  
The key has a LED bulb on the button side that indicates whether the **latest used** cylinder is locked (red) or unlocked (green).  
The key’s blade contains an NFC sensor to pass its ID and fingerprints hashes to the cylinder.  
The key has no internet connection.  
The key needs a small CR battery to enable the fingerprint scanner and the LED bulb.

* Cylinder:   
  The cylinder looks like a normal cylinder except it has:   
  1. Power supply connection.  
  2. NFC reader.  
  3. WIFI adapter.  
  4. Buttons.  
  5. Beeper module (sound)  
  6. Type-C USB socket (manage cylinder by PC/MAC app)  
    
  The cylinder accepts the keys and when it does, it locks/unlocks itself.  
  When the cylinder detects a key (via NFC) it asks for the key’s ID and if it has set up to require fingerprints it also asks the key’s fingerprint hashes.  
  when a match is found the operation can be done, otherwise it will beep to inform the user that the operation failed.  
    
  There are two options to add an allowed fingerprint

1. The user needs to press and hold the pairing button until a beep sounds and then insert the key into the cylinder.  
   If a fingerprint is required, then during the key insertion the user required to simultaneously put either the thumb or the index finger on the sensor to pass the hash to the cylinder.
2. By the application. For that case, the cylinder must be connected to the internet.  
   Once the user opens the application, he needs to either enter the key’s ID, or if the user uses the mobile application, he needs to couple the key with the phone’s NFC reader to pass the fingerprint hashes.

Removing a key from the cylinder can be done by two ways:

1. Connect the cylinder to a PC/MAC and launch the managing app.  
   Select the key to remove and click remove.
2. If the cylinder connected to the internet, then it could be done remotely from the application

When the cylinder is connected to the internet it is possible to open the lock from the application.  
To keep with the security rules, it’s to the user's decision whether to require the fingerprint scan by the phone’s scanner.  
  
There are 3 buttons on the cylinder:

1. Pairing a key (long press).
2. Enable/Disable the WIFI button (long press).
3. Reset button (long press with a thin needle).

Acceptance Criteria:

The minimum product features required before making the deliverables are:

1. A smart cylinder that can read the ID of the smart key via NFC and can add/remove allowed key IDs by using the press buttons.
2. Key that supports NFC transmission and having a small LED bulb to support lock / unlock indication.

Deliverables:

* Cylinder – Metal, flat pin, power supply, WIFI adapter, NFC reader, hard buttons, firmware.
* Key – Metal, flat blade, Fingerprint scanner, NFC Transmitter, single hard button, small indication LED bulb, embedded firmware.
* App – Desktop, Mobile and Web App to manage the cylinder. Interact with keys. Managing permissions.

Hardware Requirements:

* WIFI Adapter
* NFC Reader & Transmitter
* Sound modules (beeper)
* USB-C socket
* Fingerprint scanner
* Battery
* 4 hard buttons
* Power supply socket and plug.
* VM to host the application server