

DESIGN MOCKUP(

1. Empathise
2. Define the problem
3. Ideate the problem
4. Prototyping
5. Test

1. Empathise :

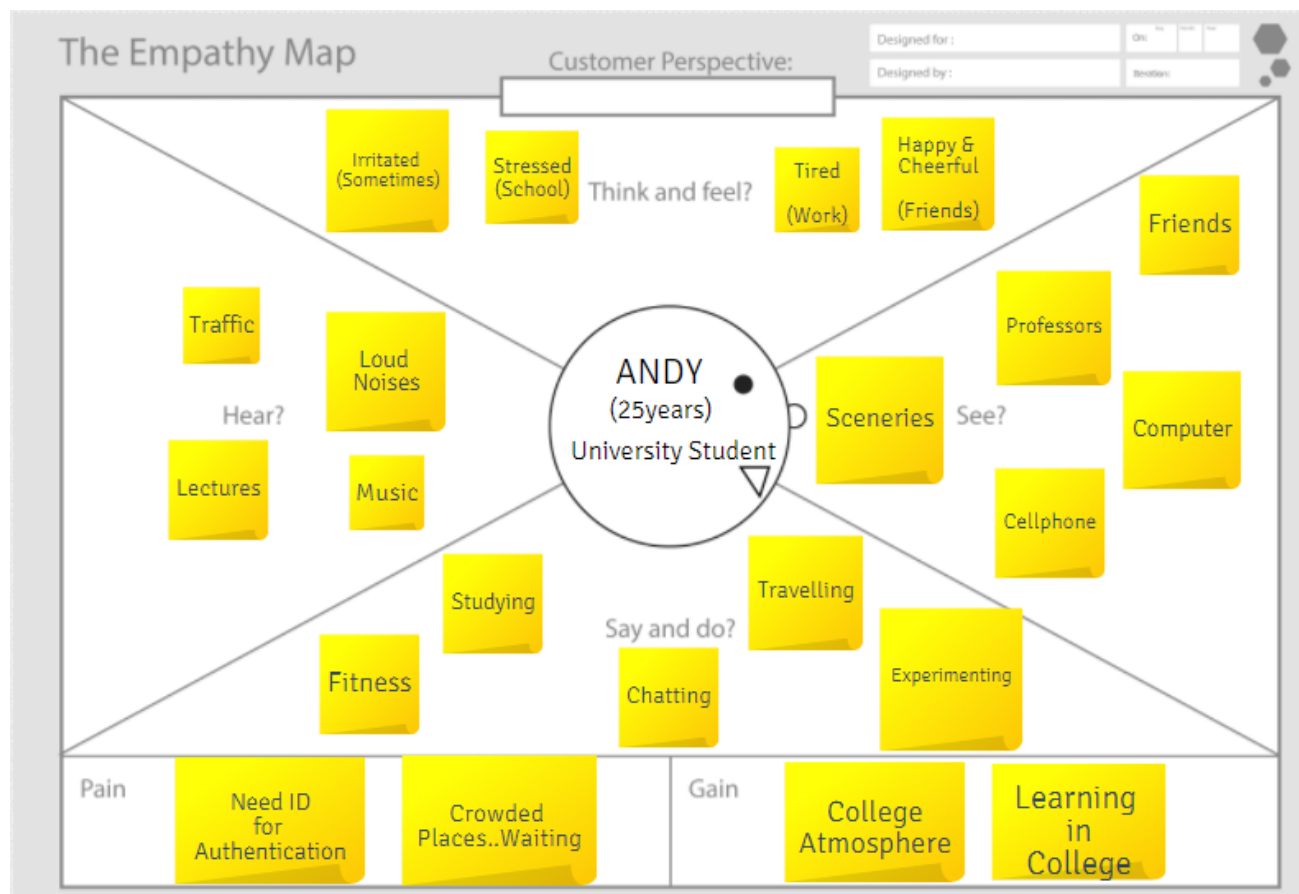


Fig1: Empathy map of university student

Observations:

From the empathy map it can be observed that :

- Andy's is a typical university student (**Think and Feel**)
- She has a busy schedule with lectures and travelling (**Hear**)
- She spends of most of her time in the university (**See**)
- She faces difficulty waiting in places where ID card is needed for authentication (**Pain**)

2. Define the problem Statement :

Fingerprint based authentication System

Build a low-cost Internet of Things (IoT) based Biometric system used for authentication using Raspberry Pi and cloud computing with use of Cryptographic algorithms to maintain the security of biometric traits. The system can be used for maintaining security by recognizing biometric traits of a person.

3. Ideate the problem :

Traditional methods for authentication are through external entities like ID cards, passwords, keys which can be easily lost or forgotten. This problem can be solved through biometrics as each person has their own unique biometrics. Biometric traits like fingerprint are actual characteristics or entities which are used to identify a human.

The system proposed here is a biometric system where fingerprint is considered as the biometric trait. The hardware requirements and the process flow is further discussed in the prototyping.

4. Prototyping :

Architecture

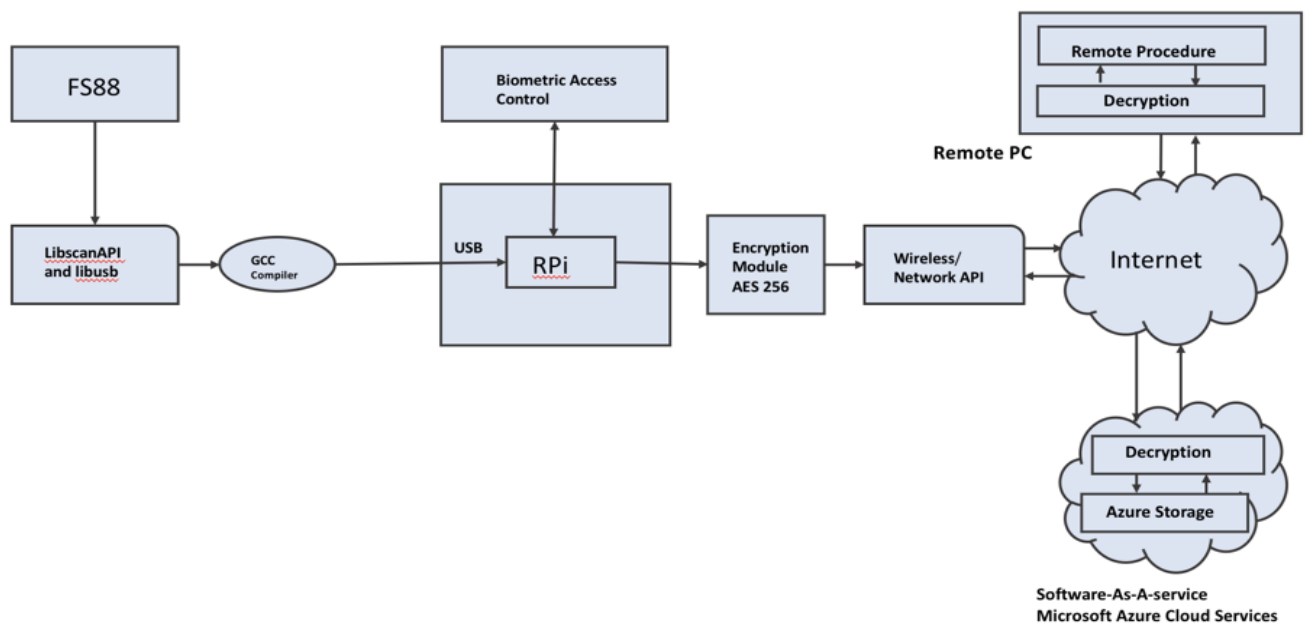


Fig2: Architecture of the proposed system

Hardware Components

A. Raspberry Pi

Raspberry Pi is a small sized mini computer. It's a small PC which brings all the functionality that are delivered by a desktop PC. The Raspberry Pi has a Broadcom BCM 2835 a System on chip (SoC). SoC has ARM 1176JZF-S 700MHz processor, Video Core IV GPU and with 512 MB memory. It uses an SD card for booting and data storage. The RPi has an Ethernet port for network connection, USB port for connecting exterior USB devices, micro USB slot for power supply, HDMI port to connect to display and General Purpose Input Output (GPIO) pins to connect to other hardware devices.

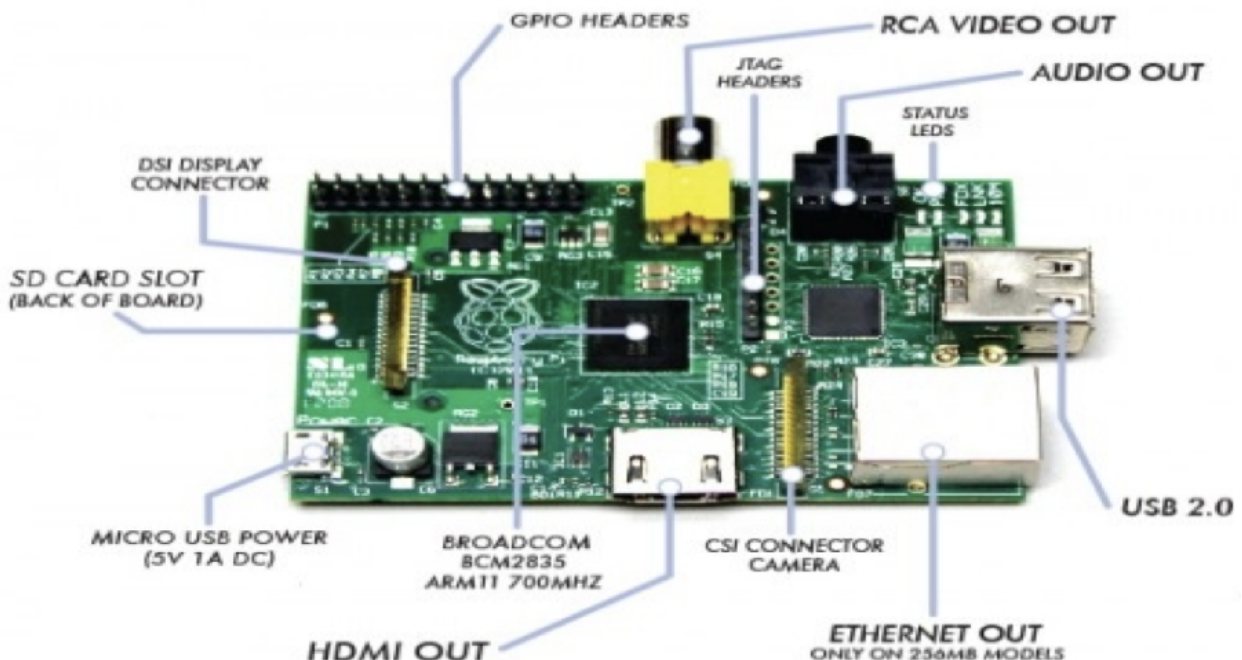


Fig3: Raspberry Pi Model B

B. Futronic FS88 Fingerprint Scanner

This is the optical fingerprint sensor used for capturing live fingerprint at the remote enrollment/authentication node running on RPi. It was certified by the federal Bureau of

Investigation to be compliant with the PIV-071006 Image Quality Specification for Single Finger Reader.



Fig4: Futronic FS88 Fingerprint Scanner

C. Wifi Adapter

The Wi-Fi adapter is used to connect the Raspberry Pi to the Cloud service over the internet. Wi-Fi antenna RPi Ralink with RT5370 chip is used for internet connection. This is a verified hardware. The configuration is explained later. CAT 5/6 Ethernet Cable can also be used for internet connection.



Fig5: USB Wireless Wi-Fi Adapter with RPi

5. Testing :

Fingerprint based authentication:

Applying the True positive, False positive algorithm.

1. If we find the fingerprint matching we can authenticate the student (true positive).
2. If we don't find the fingerprint matching for the student, we need to add one for the new student or check what data we had previously for the same. (True Negative)
3. We verify the fingerprint with that we have in our database whether it matches or not, might the information has been changed so need to update the data with current info (False Positive)
4. When the person is not authenticated(False negative)

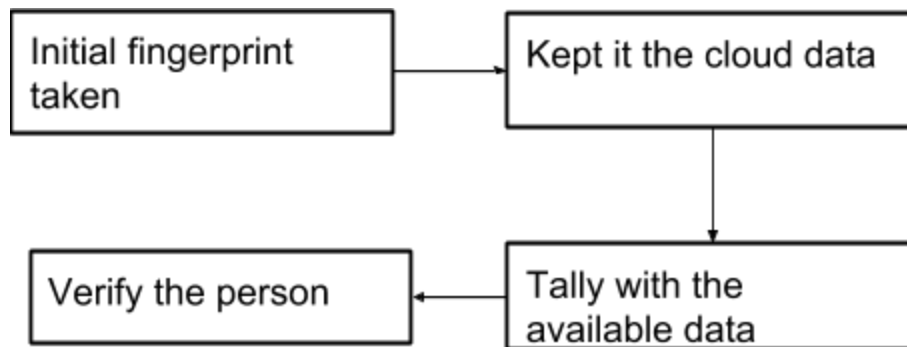


Fig5: Process Flow for testing